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FARM ECONOMICS

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JOURNAL OF FARM ECONOMICS

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A CENTURY OF AGRICULTURAL STATISTICS

HENRY C. TAYLOR

Farm Foundation

IT was a happy thought that this issue of the JOURNAL should be devoted to the celebration of a century of progress in Agricultural Statistics commencing with the first United States Census of Agriculture taken in 1840. Agricultural Statistics constitute a necessary part of the factual material essential to the development of the science of agricultural economics.

The farm economist seeks a clear mental picture of the activities of farmers and the conditions and forces in agriculture and in other occupations in this country and abroad which determine these actions. It is by thinking in terms of the facts of the everyday activity of the farm in the light of the environing forces of the farm, the home and the market, that it is possible to develop a clear-cut understanding of specific circumstances relating to the acquisition of land and capital, the operation of the farm, the marketing of products and the development of regional, national and international policies relating to agriculture. The farmer may have a fairly clear picture of the facts with regard to his own farm and yet be utterly without the necessary information to make such adjustments in his farm operations as may become necessary due to the competition of farmers in other areas or due to changes in market conditions. Just in so far as the statistical method has been applied by the Bureau of the Census, by the Division of Crop and Livestock Estimates, the Bureau of Labor Statistics, the International Institute of Agricul-

ture, and by other agencies which collect statistics relating to production, credit, marketing, and prices, the farmer may build up in his mind a fairly clear picture of the activities of those who compete with him in production or who compete for his products. Accounting may give the farmer a better understanding of the significance of the interrelations of the various elements of his diversified farming activities and, in the light of the world-wide facts of production and demand, provide the fact basis for choosing farm enterprises. Thus the choice of crops, the combination of enterprises and the timing of his marketing all rest in a large measure upon quantitative facts for which he is largely dependent upon the public statistical agencies. When these agencies carry their work to the point of perfecting outlook reports pointed toward the specific decisions which farmers must make and timed to the farmer's need, the maximum service will be rendered.

While I wish to emphasize that the quantitative data furnished by the statistical method constitute one of the most important forms of material available to the farm economist, I wish at the same time to emphasize the great importance of qualitative analysis of the farmer's economic problems in their whole setting and the accurate description of every unit to be measured by the statistical method. Otherwise quantitative data will fail to throw the light in full focus upon the questions requiring answers.

Agricultural history provides a basis for analyses and for judgments of present problems but statistics are essential to a balanced view of agricultural history. Were it not for the Census Reports giving crop and livestock data for the past 100 years, our notions of the development of the agriculture of this nation would be vague and have to be stated in very general terms. Without the census data the student would have no adequate knowledge of the way in which crops have competed with each other and how the commercial production of each gradually shifted to the area where it can be produced to the greatest relative advantage. The series of maps based upon the census data from 1840 to 1935 give an impressive picture not only of the expansion but of the shifts that have taken place in American agriculture. The statistics alone do not explain these shifts. They need to be supple-

mented by the descriptive materials found in the contemporary literature, by the facts of soil, topography and climate, and by the analysis that may be brought to bear when all of the facts have been accumulated. This is the job of the historian, the geographer and the economist.

Statistics supply the quantitative economic as well as the climatic data used by the agricultural geographer. On the other hand, physical, biological and industrial geography give the essential background for the interpreting of statistics. When we look at a map of the United States and note the areas devoted to cotton, tobacco, corn, oats, hay, wheat and grazing, we look to agricultural geography for the explanation. While this distribution of the area to the different lines of production is due in large measure to soil and climatic factors, the division of territory among the different crops is often the result of that subtle economic geographic factor—crop competition—under conditions of price controls world-wide in the making. For example, the corn belt reaches from the Great Lakes to the Gulf, but in the southern states corn comes into competition with cotton, which can be grown within much narrower limits than corn. Hence the price of cotton and corn have been such that corn has given up to cotton that part of its potential area especially suited to cotton.

The Historical Atlas of American Agriculture, a comprehensive project of the United States Department of Agriculture commenced in 1912, should be completed and kept up-to-date. The physical basis of the geography of American agriculture, including land relief, climate, soils and native vegetation, was finally published in 1936. The economic data giving an historical and comparative view of the various aspects of American agriculture were published in tentative form in the Yearbooks of the Department for the years 1921 to 1925. Since that time profound changes have taken place in agriculture which require that new efforts be made to bring this background material up-to-date. Otherwise, much of the value of current statistics to the agricultural economist may be overlooked.

The facts of land tenure in the United States would be flimsy and fragmentary without the tenure statistics which

have been available decade by decade since 1880. The general literature available prior to 1880 gives the impression that farmers in the United States owned the land they cultivated, but the Census of 1880 shows that one-fourth of the farmers of the United States were operating rented land. The popular literature with regard to farm tenancy in more recent periods might give one the impression that land ownership on the part of farmers in the United States is in danger of disappearing, but the census materials indicate that nearly three-fifths of the farmers own the land they till.

The statistics of mortgage indebtedness on farm homes collected in 1890 supplemented those for land ownership and tenancy and gave a basis for a more complete understanding of the extent to which farm real estate was actually owned by farmers. These statistics on mortgage indebtedness were subject to two interpretations. One view was that many people who had owned farms free of indebtedness had found it necessary to mortgage their farms and that the use of the mortgage was a means of descending the ladder from free ownership to tenancy. The depression of the nineties gave current illustrations which could be pointed out to fortify this position. Another view was that as a rule mortgages were given to cover a part of the purchase price of the farm, that the mortgage is an important rung in the ladder leading from tenancy to the free ownership of farms and that without farm mortgage credit, tenancy would be much more prevalent. Five decennial census reports on mortgage indebtedness provide the basis of an historical view of this disputed question and show clearly that in normal times the mortgage is a prevalent and effective method of climbing the agricultural ladder by competent farmers. This is indicated especially well by tables showing tenure and indebtedness classified by age groups of farmers. But on the other hand, there are adequate data to indicate that in depressions mortgages often carry good farmers down the ladder and that in good times the use of a mortgage may prove fatal to the inefficient farmer. Farm mortgage statistics have proved of great value in providing the fact basis of public understanding of the significance of the farm mortgage, that in the main it is a beneficial institution and one which should not only be approved but controlled and participated in by the government.

Statistical data presented in their historical setting stabilize our thinking with regard to trends in agriculture whether they relate to crop and livestock production, to the tenure of land, or to the farm population.

The statistics of farm population were not made available until the Census of 1920. Yet back in the early nineties, popular literature was decrying the flow of population from country to city and predicting dire results. It was only through the supreme effort of Charles J. Galpin of the U. S. Department of Agriculture that the Bureau of the Census commenced in 1920 to make a count of the people who live on farms. Since then a fairly clear picture has been developed not only of the number of people who live on farms but of the number migrating from country to city and from city to country. Little by little the Bureau of the Census has evolved a system of collecting facts with regard to farming and the status of farm people which gives a fairly rigid framework for the structure of agricultural history.

Crop Estimates originally had to do primarily with crop and livestock production in a given season and were of greater value to men in the markets who could adjust prices according to the prospective supply than to the farmer whose crops were already growing, but with the introduction of estimates with regard to intentions to plant and intentions to breed, the data became exceedingly important in giving the farmer a basis of deciding how much of the different crops to plant and how extensively to breed the various kinds of livestock. These estimates have been of great value to farmers although they have at times been objected to by the men who buy farm products. On the other hand, there have been times when farmers have felt that the buyers benefited more than did the farmers from the production forecasts. A thing that needs to be kept in mind is that the large-scale grain and livestock buyers have their own statisticians and are making their own estimates and could get along pretty well, perhaps, without the Government estimates, but while the buyers might have fairly good private information, the farmers would be completely in the dark without the public sources of statistics. It is only by having Government estimates that both producers and consumers may be provided with the same information. A livestock commission man in

the Union Stock Yards in Chicago once said to me, "The Bureau of Agricultural Economics is furnishing too much information with regard to the production and the flow of livestock into the market. Information which everybody has does me no good, but the information which I have and others do not have can be converted into cash."

Crop and livestock estimates and market statistics constitute the basic material essential to an understanding of the forces outside of the farmer's own fences which determine in a large measure his commercial farming activities. Farm surveys, farm accounts, labor records and other forms of specific data with regard to the individual farm are essential to the analysis of the farming enterprise best suited to the given farm. Competing and non-competing crops may be studied and data gathered which will enable the farmer to fit the different enterprises together into a system of farm operation which will utilize the labor, equipment and land of the farm in the most profitable manner. It is only when all forms of quantitative data have been gathered in the light of a clear analysis of the farmer's production and marketing problem and then analyzed and formulated to focus the light in such a manner as to enable the farmer to answer the economic questions which arise from year to year, from season to season and from day to day, that the statistical and accounting methods become an effective guide to the farmer.

Price statistics provide an essential part of the picture which must be held in mind by the farmer, the middleman, the consumer and the statesman. The Bureau of Labor Statistics has collected wholesale price statistics since 1890. The study of price trends and price relations, price flexibilities and rigidities constitutes the starting point for social-economic legislation to remedy the unbalance in the distribution of the national income. The price data of the Bureau of Labor Statistics is supplemented by that collected by many other public agencies. Especial note should be made of the work of the Bureau of Agricultural Economics on prices paid by farmers and of the use made of price statistics, trends and forecasts in the preparation of the various agricultural outlook reports. Price statistics constitute a most essential part of the economic data required by the agricultural economist.

Without accurate and detailed price statistics put in usable form, the farmer and the statesman would proceed in the dark. The agricultural economist has the challenging task and the profound duty of illuminating the path of the farmer and of the statesman to the end that the former may adjust his production to the demands of the market for the great varieties of products and that the latter may create the laws and institutions which will provide the facts and the controls essential to efficiency in production and justice in distribution.

In these times the particular attention of the statesman needs to be called to the whole problem of the interoccupational distribution of income in the concrete form of the ratio at which goods and services are exchanged and the comparability of the potential living standards of those of equivalent skill and energy in the different occupations. The statistics of incomes and living costs collected by the Bureau of Labor Statistics and the Bureau of Home Economics contain the basic facts for carrying this comparison much farther than has previously been possible. It is of great importance that these available data be tabulated, analyzed and utilized. Furthermore, a permanent system of collecting data on incomes and living costs of all classes of occupation groups should be provided. This is the starting point for individual and social action which will reduce the prevailing economic injustices in the national economy.

International statistics are almost as important to the farmer and the agricultural statesman as are the statistics of agricultural production, marketing and prices in the United States. This is especially true with respect to the farmers who produce crops which enter the export trade. In the early years of this century a successful merchant in California by the name of David Lubin became interested, through his own farming activities, in securing international crop reports and annual reports on the agriculture of all parts of the world. He felt that the farmer and the statesman were still in the dark with respect to the forces which determine the prices of many farm crops unless the national statistics were supplemented by world statistics. The persistence, the untiring energy and the vision of David Lubin were effective

in kindling the imagination of His Majesty, the King of Italy, Victor Emanuel, who in 1905 called a diplomatic convention which resulted in an international treaty signed by forty nations establishing the International Institute of Agriculture which since 1908 has carried on a continuous crop reporting service by cable, issued monthly reports and published the International Yearbook of Agricultural Statistics. The World Census for 1930 promoted by the International Institute of Agriculture was the beginning of an effort to harmonize the agricultural statistics of the various parts of the world to provide a better foundation for world crop reporting and the comparative study of world agriculture. This material has been supplemented in recent years by the publication by the Institute of the *Agricultural Situation* which was initiated as an "Economic Commentary on the International Yearbook of Agricultural Statistics." A series of monographs was initiated in 1936 giving a comprehensive statement of world production and international exchange of the major products of world agriculture. Volumes on "World Cotton Production and Trade," "International Trade in Meat," "World Production of Meat," and "Fats and Oils: World Production and Trade" have been issued. In 1935 a special study was initiated dealing with national policies affecting international trade in farm products. The results of this study have been published by the International Institute of Agriculture in a thousand-paged volume on world trade in agricultural products. This volume is based in a large measure upon the accumulated results of the statistical and legislative work of the Institute. The volume covers the recent history of world agriculture and commerce. In Part One the commodity is the unit. In Part Two, the nation is the unit.

It is a matter of no small significance that the statistical work in the United States has been in the process of development for a century. Those closest to the work realize that much progress has yet to be made. There are many subjects, particularly with regard to the life as distinguished from the industry of the farm, regarding which statistics are not available. Some of our friends who are dealing with the economic and social question in agriculture are still finding it necessary

to make crude estimates. These crude estimates are not to be despised. The "rough approximations" with regard to land tenure in England in 1688 made by Gregory King stand out as an illuminating spot in the history of English agriculture and without them we would have no quantitative starting point for discussing the decline of landowning farmers in England. It is to be hoped that some of the rough approximations made in recent years by farm economists and rural sociologists will not stand unchallenged. The hope is that they will be attacked and that the agitation will result in the collection of adequate statistics in those fields where our information is at present but shadows of the truth.

While great progress has been made in state, national and world statistics, there is much yet to be done. The taking of the United States Census of Agriculture will improve as farmers know more and more about their own farm business as a result of the keeping of accounts and as enumerators are chosen because of their understanding of the work to be done. The census may also be improved by focusing the schedule more definitely upon the questions which relate to choices which may be made by farmers or by statesmen. More facts relating to farm life are desired, but the fundamental facts of farming and the economic status of the farmer are basic. The work in this field must be continually improved.

The increasing participation of government in agriculture is making it necessary to improve upon the accuracy of many of the series. For example, now that securing greater equality in the returns to agriculture and the rest of the economy has become a paramount objective of the agricultural program, better measures of the incomes of different sectors of the population are highly needed. Recently, new effort has been turned to obtaining better measures of the income of farmers, both from the farm and from non-farm sources. The indexes of prices paid and received by farmers have recently been revised on the basis of the collection of additional data and are now in the process of further revision. A further step is the development of indexes of the physical volume of production and of expenditures and the deriving of gross and net income series from these.

Since much of the work done by public agencies must deal

with particular commodities and types of farming, it is fortunate that plans are under way for setting up such series as the foregoing by regions and type-of-farming areas. The cost data assembled in the past have mostly been for widely scattered areas for a year or two at a time. It is now realized that continuous series are needed for all the major systems of farming, this emphasis being placed more on changes than on absolute levels.

The current analyses being published for separate commodities in the "Situation Reports," it is now realized, are needed for changes in production practices, farm organization, mortgage debt, tenure, farm population and several other items. Something approximating an annual sample census is being considered for a wide range of items, and experimental work is already under way.

Recently the group interested in forestry have come to realize that they are far behind agriculture in the collection and publication of data of current change, and we may expect to see some developments in this field in the next decade.

Perhaps the largest field for expansion of statistics relating to agriculture lies in the field of distribution rather than in the field of production. The greatest economic problem of labor and of industry as well as of agriculture has to do with the interoccupational distribution of income. Whether or not intergroup peace or intergroup warfare is to prevail in this country depends largely upon the extent to which the facts of comparative income, comparative costs of living, comparative ability required, and other necessary facts are made available in a form which will provide the basis for a sane public opinion with regard to the justice of the claims of particular groups in the light of the whole national economy. If intergroup conflict is to continue without adequate comprehension of the facts, our cherished hopes for the free life of a democracy will disappear. The people must solve their own problems in the light of the facts or have them solved for them by a government which is not democratic. Groupism, blind groupism, endangers democracy in America. The hope for democracy lies in better knowledge on the part of the masses of the people. The statistician has a large function to perform in helping to provide the fact basis of intergroup justice, national and international.

A CLOSE-UP VIEW OF THE DEVELOPMENT OF AGRICULTURAL STATISTICS FROM 1900 TO 1920

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WHEN the results of the agricultural Census of 1900 were published, in 1901, comparison of acreage and production figures of most crops, with estimates published by the Division of Statistics of the Department of Agriculture for 1899, the year to which the census related, showed wide differences. For example, the Department of Agriculture's estimate of corn acreage was 82,109,000 acres, whereas the census reported 94,914,000 acres or nearly 16 per cent more; and the Department of Agriculture's estimate of wheat acreage was 44,055,000 acres, whereas the census figure was 52,589,000 acres, or 19 per cent more. Which figures (if either) were correct?

The Chief of the Division of Statistics of the Department of Agriculture, John Hyde, challenged the accuracy of the 1900 Census figures as being excessive and so a controversy arose. He had been chief of the agricultural division of the Census of 1890; and so, was familiar with many of the problems connected with the taking of a census. The chief of the agricultural division of the Census of 1900 was LeGrand Powers, previously a minister, and he had also been a Commissioner of Labor in Minnesota.

Mr. Powers of the Census, presumptively, would seem to have the better of the argument, because the census was presumed to be an actual, complete count; whereas the figures of the Department of Agriculture were conceded to be estimates. But Mr. Hyde presented data, taken from the census, which showed that more than 100 counties were credited with farm acreages, materially in excess of the total land area of the same counties, as reported by the Geographer of the Census Bureau. Also, the Census of 1900 indicated an increase of nearly 35 per cent over the Census of 1890 in

¹ Formerly statistician, Bureau of Crop Estimates, United States Department of Agriculture, and now a private crop estimator in Chicago. This article relates some of the rather intimate recollections of the writer's long experience with the field.

total acres in farm lands; whereas, from 1880 to 1890 the census data showed an increase of only 16 per cent, although the expansion of farm acreage was understood to have been greater in the decade of the eighties than in the decade of the nineties.²

Although this controversy brought to public light some of the weaknesses of both census enumerations and Department of Agriculture estimates, it was in some respects unfortunate because it exaggerated the inaccuracies in the public mind. The controversy had the effect of discrediting, without discrimination, in the minds of many people, all agricultural statistics. So, in all subsequent censuses there has been close cooperation between the officials of the Census Bureau and those of the Department of Agriculture, both before and after the enumeration, which cooperation resulted in the absence of controversy and in improvement in the work of both.

John Hyde was preceded as Chief of the Division of Statistics of the Department of Agriculture by Henry A. Robinson (1894-1898), a purely political appointee, without qualification as a statistician. He took the attitude that the duty of the statistician was to go through the mechanics of tabulating returns from crop reporters, and giving to the public the results without modification, "for what they are worth" regardless as to accuracy.³ As a result of this policy, biased estimates of acreage had a cumulative effect, and thus steadily reduced the accuracy of the estimates.⁴ Mr. Robinson allowed this to occur during his 4 years as Chief of the Division in the late nineties. Mr. Hyde, who became the statistician in the Department of Agriculture about 1898, recognized and understood the tendency of crop reporters to underestimate acreage (when expressed in percentage of the acreage of the preceding year) and the cumulative effect of such bias, if not corrected. His creation of a corps of special field agents, be-

² The increase in farm acreage from 1900 to 1910, according to census figures, was less than 5 percent; and from 1910 to 1920, about 9 percent increase.

³ This statement is based upon a copy of a letter written by Mr. Robinson found in the old files of the Division.

⁴ By this is meant that when schedules of inquiry ask for estimates of acreage, in percentage of the acreage of the previous year, an underestimate may be expected, say, of 4 per cent; in the next year another underestimated percentage is applied to the preceding underestimated acreage; and so on, each additional year adding to the accumulated error.

ginning about 1900, was partly for the purpose of developing a source of information which would overcome this known bias of farmer crop reporters. This was an important step in the progress of crop reporting in the United States.

My entrance into the crop reporting service of the Department of Agriculture as one of these special field agents⁵ was on August 1, 1904. My assignment as a field agent included five states (Ohio, Indiana, Illinois, Michigan, Kentucky), with a roving commission; and I was required to make a report upon the condition of the various crops as of the first of the month for each of the five states, similar to reports being made by the state statistical agents. It was not long before I learned from experience that it was impracticable, if not impossible, to report satisfactorily upon the condition of crops in each of five states as of a certain date by travel and observation alone. Questions as to percentage of increase or decrease of acreage, or of yield per acre, which did not relate to a specific date, could be investigated in this way, by contacting specialists in certain crops in various parts of the states covered. After some time I was authorized to maintain several hundred select correspondents, who reported to me as of the first of each month. These reports also helped me in planning my travels, because I generally went to those sections where my mailed reports were most conflicting, and this experience demonstrated the value of the now widely used combination of personal field observation with reports from correspondents.

The Development of the Crop Reporting Board

An important turn in the affairs of the Bureau of Statistics (changed from a Division to a Bureau about 1903) and of crop reporting resulted from the so-called "cotton scandal of 1905." It resulted in the formation of the Crop Reporting Board, and also in the passage of a law making it a statutory offense for anyone connected with the making of government crop reports to speculate in the futures markets. Ed. S.

⁵ Previously I had been writing weekly crop review for a grain-trade paper (Cincinnati Price Current) based upon returns from about a thousand post card correspondents. Field agents, between 1900 and 1904, were frequent callers at the Price Current office, especially Ed. S. Holmes, John Darg, and Tom Baldwin; and so, I became familiar with their work.

Holmes, then Associate Chief of the Bureau, took advantage of the advance knowledge of what the government report would show and speculated in the cotton futures market.⁶ Although the Chief of the Bureau, Mr. Hyde, was not implicated in the cotton scandal, he was dismissed at about the same time on account of some other irregularities, and thus the Bureau was left without a head at a critical time.

Shortly before this (January 1, 1905), there had been appointed a new Assistant Secretary of Agriculture, Mr. Willett M. Hays of Minnesota. Mr. Hays was full of enthusiasm, with new ideas, which got on the "nerves" of the secretary, James Wilson, who had, for a long time, run the Department in his own way, and did not care much for the help from the new assistant, Mr. Hays, who, therefore, had little to do. Under these circumstances, Mr. Wilson turned the affairs of the Bureau of Statistics over to Mr. Hays.

Mr. Hays was not a statistician, but he had a fertile mind; and he devised the plan of calling together two section chiefs and two special field agents, as a committee, with himself as chairman, to go over the crop material previously handled by the Chief of Bureau alone; and as a committee rather than as an individual, determine the official state estimates of the various crops. Various precautions were used to prevent any information from getting out before the proper time. The committee worked behind locked doors; tabulation sheets of county and township reports were so manipulated that the clerical force, in making final computations, did not know to what state or crops the figures related. As the final figures, or estimates, were determined by the committee, no individual knew the final official figures in advance. The plan worked well. The calling of field agents (and later, state statistical agents) to serve as members of the Board, was good training for them, and helped to increase their efficiency. And so, the Crop Reporting Board, thus started, has become an important part of the government crop reporting service. In 1906, Victor Olmsted was made Chief of the Bureau of Statistics, but notwithstanding the appointment of a new

⁶ In the trial of Mr. Holmes it was brought out, as I remember, that in one deal alone Mr. Holmes' share of the profits was more than \$70,000. The result of Mr. Holmes' trial, after dragging in the courts for several years, was a fine of \$5,000, which was paid to Mr. Jesse Adkins who prosecuted the case for the government.

statistician the Crop Reporting Board was continued, Mr. Olmsted serving as Chairman instead of Mr. Hays.

Early in 1907, Mr. Olmsted was given a leave of absence to take the Cuban Census.⁷ Mr. C. C. Clark, who had been Assistant Chief of the Bureau of Statistics was made Associate Chief of Bureau, and Acting Chief during the absence of Mr. Olmsted, and I was called from the field service to become the Assistant Chief.⁸

In 1909, Mr. Clark was appointed the first statistician of the newly organized International Institute of Agriculture at Rome. About the same time Mr. Olmsted returned to the Bureau. Mr. Olmsted gave me practically a free hand in the statistical affairs of the Bureau, while he attended to the purely administrative duties.

Early Statistical Problems

It may be noted here that most of the work of the Bureau was the making of estimates; that the estimates were mostly in the form of percentages (or estimated yield per acre); and that the primary data for the estimates were obtained by the sampling method. Therefore, statistical problems connected with sampling were important matters for consideration by the statistician. At that time there were four independent sets of samples, collected and computed into state averages as follows:

- (a) The so-called "township" reports, about 45,000 in the United States, computed without weighting into state averages.
- (b) The "county" reports, so-called because each reporter represented a county (about 3,000 in the United States). Each county reporter was supplied with "frank" envelopes and several schedules, by which to get information from the various parts of the county (this was before the automobile days). County reports

⁷ In the previous Cuban Census he had been the Assistant Director.

⁸ This position was in the classified civil service; the field service was not; and, therefore, I had no civil service status. The appointment was made though an executive order signed by President Theodore Roosevelt. I have sometimes doubted whether I could have passed a regular civil service examination to become eligible for the position. However, from my experience in the Bureau I have become strongly a supporter of the civil service system.

were mailed to Washington and weighted to get state averages.

- (c) State agents' reports—nearly every state had a state statistical agent, who was supplied with schedules containing the same questions as on the schedules sent to township and to county reporters. He maintained his own list of reporters, and sent to Washington only his state estimates. State statistical agents were not in the classified civil service and most of them were paid from \$300 to \$600 a year as a part-time job.
- (d) Field agents' reports, each agent covering two or more states, traveling, observing, interviewing, maintaining a small but select list of correspondents, and using much personal judgment in making estimates for each state. It was full-time work, but not in the classified civil service.

In statistics involving the sampling method, much time and expense can be wasted by excessive sampling and by over-refinement in weighting. Accuracy, or precision, of results does not follow in proportion to the work expended. After a certain number of samples is obtained, no material increase of precision is obtained by increasing the number.

Shortly after taking charge of the statistical work at Washington, I found that the system of weights applied to county reports had as many as three or four significant figures; for example, in computing the state average of a given crop, County "A" may have a weight of, say, 784 County "B," 62; County "C," 367; etc. This involved much clerical work in making the "extensions." These weights were simplified to one significant figure, as 800 for County "A" above, 60 for County "B," and 400 for County "C," etc. When these simplified weights were put into practice, one clerk, who had been making these laborious extensions, with pencil and pad, for years, said to another clerk, "That man must be crazy." She secretly computed the averages for the states she worked upon, with the old set of weights and with the new set of weights and was astonished to find that the results were exactly the same. This simplification in weighting greatly reduced the volume of work with no sacrifice in accuracy.

Economy requires as even a distribution of work through-

out the month and throughout the year as is possible. When I took charge of the statistical work of the Bureau I found a poor distribution of work. For a week or 10 days while the crop reports were being tabulated and computed the clerical force was very busy; but during the rest of the month the work load was light and there was more or less idling away of time. Also, there was not much work to be done in the winter and early spring months. To correct this situation, a series of investigations was begun, without extra cost and which did not require a set time for completion. Among the new investigations thus started, a series of farm prices, was probably the most important. Of all the questions put to the Bureau which could not be answered at that time, those relating to prices which farmers received for their products were most frequent. But other investigations were also instituted.⁹ The Bureau of Statistics has a splendid organization for making statistical investigations of the extensive type. Other branches of the Department were accustomed to making investigations of the intensive type. The officials of the Bureau of Statistics encouraged cooperation with other Bureaus by making "extensive" inquiries for them. But the Bureau reserved the right to determine what questions should be sent to its voluntary crop reporters. I recall that once an investigator in another branch of the Department submitted a schedule of inquiry to be sent to crop reporters, having 50 or more questions, many of them complex and difficult to answer. From my experience I knew that such an inquiry would be an imposition on the voluntary crop reporters, and that few would reply. When I suggested a simplification of the inquiry, he said: "Well, I put in every question I could think of." This incident is given to emphasize that to achieve success in extensive inquiries it is necessary to have as few questions as practicable, and they must be made as easy as possible to answer.

⁹ At the time (around 1910 to 1914) there were several young men in the Department of Agriculture, who formed the "Rural Economics Club." Among those were B. B. Hare who later became a member of Congress from South Carolina, and E. E. Goldenweiser, now the Director of Statistics and Economics of the Federal Reserve Board. The meetings of this club, in which I was interested and more or less active, gave me suggestions for special investigations, which could be made without extra cost to the Bureau, but rather as a result of better labor distribution within the Bureau.

Objections to "Normal"

Of all the work done by the Crop Reporting Service, probably the most discussion and academic criticism has been directed at the condition reports, expressed in percentage of normal; or rather the use of the term "normal" itself. And yet, of all the data collected by the Bureau the averages obtained from questions regarding percentage of normal had the highest degree of precision, and in other ways were so satisfactory as to give no practical difficulties. The use of the term "normal" gives no difficulty to the statisticians in the Bureau who have much experience with the term. On one occasion, an apple specialist in the Bureau of Markets was so critical of the use of the term "normal" in connection with apple reports, that a meeting was called, presided over, as I remember by Wm. A. Taylor, Chief of the Bureau of Plant Industry, to discuss the subject of apple reporting. The production, as well as the condition of the apples, and of some other crops was estimated in terms of normal. This apple specialist talked for some time to the effect that apple men do not use the term normal, and, therefore, it should not be used in crop reports. "What improvement do you suggest?" he was asked. "That is easy" he replied; "Ask for the production in comparison with last year, which is understandable." To which I asked, "What if last year was a complete failure?" as frequently occurs locally in the case of tree fruits. He had no comeback; he may have known his apples but he did not know his statistics.

The Bureau has made many experiments in methods and questions. For example, it has asked yield of apples in terms of bushels and barrels, per tree, and per acre, respectively. One suggestion frequently made has been to ask the question of condition in terms of prospective yield per acre (as bushels in the case of grain). This experiment has been made, and it has been found that early in the growing season, many reporters will estimate the condition in terms of normal but will not do so in terms of prospective yield per acre. Also, the precision of reports expressed in percentage of normal is higher than when expressed quantitatively (as bushels per acre).

The biggest crop of suggestions for improving crop statistics was produced during the time of the war. One suggestion frequently made was the use of county agents. They were supposed to know all about their respective counties. To test them out, a special county agent list was made up to report upon the cotton crop, supplementing the regular sources of information. The experiment proved that as a source of statistical information a list made up entirely and only of county agents was worthless. Probably the most persistent and effective suggestion was the use of threshing returns, to obtain the amount of grain threshed. This would be an absolute count, no estimate or guess work. An appropriation large enough to run the Crop Reporting Service was made for collecting threshing returns. An act made it compulsory on the part of threshers to make returns. William Thompson, of the Bureau of Markets was put in charge of the project; hundreds of clerks were employed. James Covert, a clerk in the Bureau of Crop Estimates was loaned to assist Mr. Thompson; otherwise the Bureau of Crop Estimates had nothing to do with the project. Mr. Thompson at the beginning was hopeful of favorable results; but after nearly a year's work and expenditure of many thousands of dollars the whole project was scrapped as a failure.

Quantitative Estimates after 1912

Until 1912 the Bureau made reports on the condition of crops only in percentage of normal condition. It made no attempt to interpret its own percentage of normal estimate into a quantitative figure. An advantage of a quantitative interpretation is that it combines into one figure the two factors which make up total production—namely acreage and prospective yield per acre. The condition might be, say, 5 per cent less than a year ago, but if the acreage be 10 per cent larger, a larger production is indicated.

Private statisticians had for many years given their own quantitative interpretations of the government percentage condition figures, using different methods with different results. Why should not the government interpret its own figures? When I asked the secretary, James Wilson, for approval to make such interpretations, or "forecasts" as they

are now generally called, he said in effect: "All right but try it out on grain before you touch cotton; because cotton is dynamite." This is why the "forecasts" were made on grain a year before they were made on cotton. These "forecasts" were favorably received and are now generally preferred to the percentage of normal figures upon which they were largely based.

Changes in Organization

When Woodrow Wilson became President and David Houston, Secretary of Agriculture, on March 4, 1913, B. T. Galloway became Assistant Secretary of Agriculture, largely in charge of the internal affairs of the Department. Mr. Galloway was previously Chief of the Bureau of Plant Industry. While James Wilson was Secretary of Agriculture, there were weekly meetings of the Bureau chiefs in his office. In these meetings friction was apparent between Mr. Galloway and Mr. Olmsted. About a month or so after Mr. Galloway had become Assistant Secretary, he sent a note to Mr. Olmsted notifying him that he was thereby suspended as Chief of Bureau and that I was to serve as Acting Chief, pending an investigation of the affairs of the Bureau. A semblance of an investigation was made, but no important irregularities were disclosed.

After several months Mr. Galloway called me to his office and asked me what, if any, changes I would suggest if I were permanently in charge of the Bureau. I outlined my ideas, and was requested to put them in writing. This I did,¹⁰ and the plan of reorganization was approved. The main part of the plan was the abolishment of the part-time position of the state statistical agent, and of the special field agent; and in their place the appointment for each state, a full-time statistical agent, under the classified civil service, who should combine the duties of the two positions abolished. In other words, it is essentially the present organization of state statistical agents.

A few days after Mr. Galloway approved the plan of reorganization, he again called me to his office, and after a little

¹⁰ Report to the Assistant Secretary of Agriculture, dated July 16, 1913, signed by Nat C. Murray, Acting Chief of Bureau, now filed in the National Archives, Washington, D. C.

pleasant chat, said: "Mr. Murray, you have been Acting Chief for some time; how would you like to have it made permanent?" To which I replied: "Mr. Galloway, if the offer came under different conditions it would be acceptable; but I believe that an injustice is being done to Mr. Olmsted." To this he straightened up and almost in anger said: "If that is the way you feel about it I have nothing more to say." A few days later the announcement was made that Leon Estabrook was appointed Chief of the Bureau of Crop Estimates. (He was formerly Mr. Galloway's secretary.) The selection of Mr. Estabrook proved fortunate for the Bureau. He was an able administrator; I had no liking for administration. Within a few months he and I worked in the closest harmony, doing perfect team work. It was Mr. Estabrook who carried out the plan of reorganization as recommended.

The consolidation of the Bureau of Crop Estimates and the Bureau of Markets was first suggested by George Livingston, then Chief of the Bureau of Markets. The proposed consolidation was voluntary. Mr. Estabrook considered the plan from an unselfish standpoint, offering to become Associate Chief of the consolidated Bureau. Later there was a triple consolidation, including the Division of Farm Management. Mr. Livingston resigned and Dr. H. C. Taylor became the Chief of the new Bureau, the Bureau of Agricultural Economics.

WHY THE GOVERNMENT ENTERED THE FIELD OF CROP REPORTING AND FORECASTING

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A LOOK back over this country's hundred years of effort with agricultural statistics reveals so wide a range of conditions and forces that a brief paper can but cite some high points. Even as late as a century ago the fortunes and destinies of America seemed to be largely those of agriculture. The bulk of the population lived on farms and nearly everyone had some agricultural interests. Clearly, the thinking of the time was extensively projected against a rural and pioneer background. Just as Washington, Franklin, and other early leaders were concerned with farm problems, so most gentlemen of the time had their interests in agriculture. Many of the early 19th century farmers became men of property and "achieved a middle-class prominence."¹

In an era of greatly reduced farm prices after 1820 agriculture was in a low phase,² but agricultural organization and consciousness seem to increase in periods of falling or low farm prices,³ and the decades after 1820 offered ample incentive for calling attention to unsatisfactory farm conditions. Agricultural information of all kinds was sought especially that regarding markets and means of reaching them. Higher farm prices after 1835 and the partial crop failures in 1837 and 1838 caused the importation of large quantities of foodstuffs and aroused apprehension of public men.⁴ Among these was Henry L. Ellsworth,⁵ Commissioner of Patents,

¹ Neeley, W. C., *The agricultural fair*, p. 22. Columbia University Press, 1935.

² *Ibid.*, p. 73.

³ Bidwell and Falconer, *History of agriculture in the Northern United States*, p. 191. 1820-60.

⁴ Neely, p. 77.

⁵ Henry Leavitt Ellsworth was born at Windsor, Connecticut, March 10, 1791. He was the son of Oliver Ellsworth who was a member of the convention which framed the constitution and afterwards Chief Justice of the United States Supreme Court in Washington's administration. He lived on a farm at Windsor and was extensively interested in agriculture. He was graduated from Yale in 1810 and then studied and practiced law. In 1832 he was appointed as one of the commissioners of Indian affairs in the region southwest of Arkansas. He traveled in the prairies prior to 1835 and became convinced of their agricultural possibilities, and he began to

who was destined to become the moving spirit in the country's first systematic public undertaking in agricultural statistics and agricultural inquiry generally.

During this time the agricultural west was expanding rapidly. Farm production was mounting in the Ohio Valley and in parts of the upper Mississippi Valley, and with improving transportation facilities the pressure of these new supplies was keenly felt in the eastern markets and by the farmers of the older states. In 1840 Solon Robinson of Indiana wrote: "As the great western prairies begin to furnish this staple (wheat) to the East, it will soon be time for farmers there to turn their attention to other products. For, as here no regard is paid to the preservation of the quality of the soil, while its present quality lasts the eastern farmer cannot compete with the western wheat grower."⁶

There can be little doubt that leading farmers, especially the gentlemen farmers, in the eastern states felt seriously the economic pressure of western competition and they became more and more desirous of getting information on the development of the country's agriculture and the extent of this growing industry and resource. The desire for such information was, no doubt, widespread and eventually it was expressed in two types of government action:

- (1) An appropriation for agricultural statistics and other agricultural purposes to the Patent Office in 1839; and
- (2) The inclusion of a series of agricultural questions in the Census of 1840.

The movement to have agricultural inquiries included in the United States census crystallized in the publication of a

purchase for himself and others large tracts of land in the region from Michigan to Iowa. He was secretary of the Hartford County Agricultural Society and expressed advanced views on the problems of agriculture. He became Superintendent of Patents in 1835 and established headquarters for his land operations at Lafayette Indiana, with one of his sons in charge.

As Commissioner of Patents he was impressed with the numerous inventions of agricultural implements and processes, and began early to collect seeds and plants for distribution with the aid of Congressmen and others, and his energy and interest led to the first appropriation of \$1,000 on March 3, 1839, from the Patent Office fund for the collection of statistics and other agricultural work.

Condensed from United States Dept. Agric. Misc. Pub. 251. A history of agricultural experimentation and research in the United States, 1607 to 1925, by A. C. True, pp. 23 to 26.

⁶ Letter of Solon Robinson of Indiana dated February 28, 1840, to the Albany Cultivator. Indiana Historical Collections, 31: 128.

unique book⁷ by Archibald Russell in 1839. In this odd and interesting volume the author proposed an extensive statistical inquiry into the resources of the country which appears to have been suggested earlier in a message by President Van Buren. The author stressed the nation's need for statistics, and the scope of his views is in part revealed by the following statement: "If political economy as a science is ever to regain its position, it must be by laying a more solid and secure foundation, and by raising the superstructure of theory upon a basis of facts not drawn from imagination but the results of patient statistical investigation."⁸

In the plea which this volume made for a peace-time measure of "the ordinary pursuits of the people"⁹ he summarized in considerable detail the types of data needed. In his section on agriculture¹⁰ he suggested the enumeration of the numbers of livestock including horses, cattle, cows milked, sheep, swine, and mules; and also that the acres and the average return per acre be enumerated for wheat, barley, oats, rye, buckwheat, corn, potatoes, hay, cotton, tobacco, rice, and sugar. He proposed to show, "the improvement or alteration in the several counties in each state . . . to exhibit the increasing wealth of the country at large." Curiously, too, he anticipated that the question of the constitutionality of such an undertaking would be raised and definitely considered that issue.¹¹ Agricultural questions were first introduced into the United States Census for 1840, apparently as the result of a strong movement of which this book was a product. While the Census of 1840 collected certain livestock statistics and data on the production of the more important crops, the suggested inquiry on acreage was not made by the census until 1880, or about four decades after Archibald Russell's proposal, the constitutionality of which he felt himself called upon to defend in 1839.

⁷ Principals of statistical inquiry as illustrated in proposals for urging an examination into the resources of the United States with the census to be taken in 1840. Published by D. Appleton Company, New York, 1939. A copy is in the Library of Congress.

⁸ *Ibid.*, p. 7.

⁹ *Ibid.*, p. 14.

¹⁰ *Ibid.*, pp. 99 to 120.

¹¹ *Ibid.*, p. 21.

Agricultural Statistics in the Patent Office

In his report for 1837, Mr. Ellsworth, the Commissioner of Patents, commented upon the increasing attention which inventors were giving to the improvement of implements and labor-saving machines for agriculture.¹² Prophetically, he wrote as follows: "Already the process of sowing, of mowing, and of reaping is successfully performed by horse power, and inventors are sanguine in the belief (and probably not without reason) that the time is not far distant when the plowing machines will be driven by steam." He indicates that the subject of agriculture was forced upon his attention by those engaged in improving the implements of husbandry, and he apologetically urged that Congress give some consideration to agriculture, and expressed the belief "that Congress will find it of public interest now or in some future period to give more definite character to the measures which have thus been commenced for this most important object." In his report for 1838,¹³ the Commissioner of Patents in a letter dated January 22, 1839, and addressed to the Chairman of the Committee on Patents,¹⁴ discusses various agricultural matters and indicates that the Committee has considered making provision for agricultural statistics as follows: "I rejoice that agricultural statistics have been deemed worthy of inquiry by the honorable committee. Other enlightened nations have ranked such information amongst the most important in providing for the public wants, guarding against speculation and as a means of estimating the probable state of exchange so far as it is effected upon a surplus or scarcity of the crop."

It was in its closing hours on March 3, 1839, that Congress finally appropriated the modest sum of \$1,000 for that work, and in his report for the year Commissioner Ellsworth showed an item of expenditure "for agricultural statistics and seeds" of \$126.40 out of a total Patent Office Expendi-

¹² House Document No. 112, pp. 4 and 5, 25th Congress, 2nd Session.

¹³ House Document No. 80, 25th Congress, 3rd Session.

¹⁴ Isaac Fletcher, representative from Vermont, on January 21, 1839, wrote to Ellsworth requesting information regarding the collection and distribution of seeds; and also the practicability of obtaining agricultural statistics. See James M. Swank, *The Department of Agriculture, Its history and objects*, Departmental Report No. 7, 1872.

ture of \$20,799.95.¹⁵ In the report for 1840¹⁶ the commissioner referred to his various efforts in agriculture and mentions the agricultural inquiries which were included in the Census of 1840. In the report for 1841¹⁷ remarkable progress is noted in the work in agricultural statistics. The exhibit shows an expenditure of \$125 for agricultural statistics and seeds. A table is included which shows by states the estimated amount of wheat, barley, oats, rye, buckwheat, Indian corn, potatoes, cotton, tobacco, sugar, and rice raised in the United States in 1841. These data were actually estimates of production based on the census taken in the previous year and they constitute the first government crop report published in the United States. Only the spirit of a genius engaged in a labor of love could accomplish the work of Ellsworth on the small means at his disposal.

In another part of the document are also shown summaries of the data gathered by the census for 1839. Data for the various crops were shown for 29 states and territories and the District of Columbia. Following the tabular material under the title, "Remarks on the Agricultural Statistics," an extensive discourse on the trend and development in agriculture is offered. In that year the expenditure for agricultural statistics and seeds were given as \$451.58. Mr. Ellsworth published these annual estimates of agricultural production and showed small expenditures for this purpose for the years up through 1844. The commissioner dwelt at length on statistics for agriculture, and it is always obvious that much of the work done was based on personal initiative rather more than it was the result of resources made available for the project. Mr. Ellsworth conducted the work through correspondence and through the use of newspapers and reports and he did much of it on his own time.

While an appropriation of \$1,000 had been made in 1839, it was not renewed in 1840 or 1841. Even though no appropriation was made, the annual crop reports were continued on Ellsworth's personal initiative and small expenditures were reported each year from the patent fund. The appropri-

¹⁵ Senate Document No. 111, dated January 24, 1840, p. 53.

¹⁶ Senate Document No. 152, dated February 3, 1841.

¹⁷ Senate Document No. 169, dated February 7, 1842.

ation was renewed in 1842 and continued to 1846. In 1846 the agricultural appropriation was omitted but it was revived in 1847 and made annually to 1854. After 1853 the appropriation for agriculture was annually made directly from the treasury.

Mr. Ellsworth resigned as Commissioner of Patents in 1845 and in the report for that year, which was made by his successor, a sharp change is immediately noted.¹⁸ While it treated at length the subject of agriculture, there no longer was present the deep personal interest so clearly expressed by Ellsworth. An expenditure of \$2,392.41 is noted for agriculture, but the discussion of this subject is more from the standpoint of general progress and the statistical tables which had become so familiar were missing. The new commissioner indicated that these crop reports probably were not reliable, but he intimates that if the states were to make appropriations for the collection of agricultural statistics and forward the data to the Patent Office he would be glad to summarize them for the United States. It is perhaps worthy of note that the medium of the assessors was here suggested for the general collection of agricultural statistics.

Actually, with the departure of Mr. Ellsworth from the Patent Office the work of the Federal Government in agricultural statistics waned, except for that which was continued in the census. The annual intercensal estimates were not revived until after the Department of Agriculture was organized in 1862. In 1849 the Department of Interior was established and the Patent Office with its agricultural work was transferred to it.¹⁹ Nothing in the way of original work in agricultural statistics, however, appeared from this department.

During the 50's there was a marked development of the agricultural societies in the United States, and some of these took a keen interest in a revival of work in agricultural statistics. In 1855 James T. Earle, President of the Maryland Agricultural Society, sent a letter to the presidents of the societies in other states, in which he made a plea for the procurement of the earliest possible information on crops which

¹⁸ House of Representatives Document No. 140, dated February 24, 1846.

¹⁹ Greathouse, Charles H. U.S.D.A. Div. Pub. Bul. 3, 2nd Revision 1907, p. 8.

could be made available to the farmer so as to guide him in the selection of the time to market his product.²⁰ He indicated that in the absence of such data speculators commonly took advantage of a lack of information. The complaint against the speculators was of course not new. Ellsworth had referred to the need for statistics "to guard against monopoly or an exorbitant price."²¹ Advocates of a department of agriculture increased in number and in influence during the 50's, and in 1862 such a federal department was established and the first report of the new department revived work in agricultural statistics.

In the interval between Ellsworth's early efforts to gather agricultural statistics in the Patent Office and the organization of this work, a new emphasis had come. While the early efforts and references deal only with annual inventories or summaries of production, by about 1860 the demand appears to have been for current monthly data on crop prospects, similar perhaps to those undertaken by Orange Judd in 1862. That the desire for statistical information on agriculture was continually present in that long conflict of forces which resulted in the establishment of the Department of Agriculture in 1862 seems clear. In his message to Congress in 1861, Lincoln called attention to the immediate need of an "agricultural and statistical bureau."²² It is not surprising, therefore, that when the department was established, statistical work was undertaken as one of its early activities.²³

The Beginning of Monthly Crop Reports

Current monthly reports on crop conditions in this country were published for the first time in 1862 when Orange Judd, editor of the *American Agriculturist*, asked the subscribers of his paper to volunteer in the service of sending in monthly crop reports for the 5-month period from May through September. He proposed to publish the summaries monthly so that current information might be available to farmers regarding prospective crop production. In March of

²⁰ U.S.D.A. Misc. Pub. 171, Nov. 1933, p. 4.

²¹ Senate Document No. 169, dated February 7, 1842.

²² Quoted by Cory, R. H. The Senior Honor Thesis at Yale, May 1936, p. 9, unpublished.

²³ U.S.D.A. Misc. Pub. No. 171, p. 4.

1862 he wrote: "It is well known that in this country we have no public system of gathering from year to year, and at different times in the year, the statistics of the condition and probable yield of our growing crops. This work should be done by the General Government, but at present it is not, nor is it likely to be for a year or two at least."²⁴

Judd was impressed with the disadvantage of farmers from the standpoint of supply and market information. In those disturbed early Civil War years matters of rising prices and speculation were undoubtedly impressive. Judd commented as follows: "Shrewd speculators, who have on hand a large stock of old grain, often circulate newspaper reports to the effect that owing to bad weather, insects, small breadth, etc., there will not be half a crop gathered. On the other hand, as the harvest begins, another class intending to become grain buyers, are interested in magnifying the yield for the purpose of depressing prices. Thus, not only the producers, but many dealers themselves, are in a state of doubt and uncertainty. . . . In short, there is such an entire absence of reliable statistics that all are in a state of doubt and uncertainty, and none more so than the non-commercial producers. This state of things we propose to try to remedy, to a small degree at least, if we can secure the aid and co-operation of our readers."²⁵ He urged the cooperation of his subscribers in supplying the desired information and he made repeated pleas for additional reporters. It is significant that in June of 1862 he published in tabular form the returns from 973 reporters from 21 states. Then, as now, the number of reports received tended to show a distribution somewhat proportional to that of the country's agriculture.²⁶

Apparently Judd was conscious of performing an important service to the country and its agriculture as is indicated by the following plea for more reports: "We shall be glad to have many more names of these who will assist in this public enterprise, especially from localities in the great corn and grain growing regions of the middle and western States, not yet represented. We are thankful in behalf of the country,

²⁴ American Agriculturist, March 1862, p. 72.

²⁵ American Agriculturist, March 1862, p. 72.

²⁶ American Agriculturist, June 1862, p. 186.

for the interest already manifested. In many places, Farmers' Societies and Clubs, have taken hold of the matter with spirit, appointing competent reporters to receive the blanks, and promising constant cooperation on the part of the officers and members. In several instances the President or Secretary of a County Society has been appointed, and he in turn has chosen assistant reporters in each town in the county—a capital idea. We have devised a system of numbers, which will convey a great amount of information in regard to the breadth and condition of the crops, in a very small space. Our next paper will show the method and its results."²⁷

For a 5-month period the *American Agriculturist* regularly published the crop reports based on the returns from the subscribers. In this venture the largest number of reports was received in July of 1862 when the table shows a total of 1,557. Beginning with August there also appeared some comment on the crop situation in Europe and other foreign countries. Judd looked upon his venture into the crop reporting field as a temporary one. He foresaw the need of the government's undertaking this work and with the organization of the Department of Agriculture he gave up his efforts and the Department has issued systematic crop reports since July 1863.

That a profound interest prevailed in the work as a result of the extensive demand for more information by farmers is clear. Isaac Newton, the Commissioner of Agriculture, in the first crop report makes the following statement: "Ignorance of the state of our crops invariably leads to speculation, in which oftentimes, the farmer does not obtain just prices, and by which the consumer is not benefited. . . . The relations between agriculture, manufactures, and commerce, demand that something should be done to obtain, and publish, at brief intervals during the crop season, reliable information of the amount and condition of these crops. . . . The connexion between the industrial pursuits creates mutual interests. There is no clearer principle of political economy

²⁷ *American Agriculturist*, May 1862, p. 133.

than this, that as the farmer is enriched all other classes prosper."²⁸

While monthly reports on crop prospects have been issued by the government during the growing season since 1863, annual estimates of crop acreage, yield, production, and values were begun in 1866. Reports on prices were begun in 1867.²⁹ More and more statistics from other countries were included in the reports. As the work became better established and data more complete, comments became more extensive on the general situation in agriculture. In 1872 the Division of Statistics had 3,000 correspondents. By 1882 when a reorganization took place its appropriation was raised to \$80,000,³⁰ and a European agent was appointed.³¹ It was believed that the spread of agricultural information regarding crop prospects, prices, and the foreign situation, would assist the farmer in receiving a fair price for his products which was considered the function of the statistical service.³² In efforts to make the data on agriculture widely available, publication and editorial work grew and the Division of Publications originated as a section of the Division of Statistics in 1889.³³ Then as now editorial work and publication were an essential part of statistical work.

After the Civil War a majority of the American people still lived in rural areas. Agriculture was gradually becoming more commercial and less self-sufficient, but it continued to be looked upon as the nation's primary source of wealth. Its basic importance was quite universally accepted, perhaps along with the popular notion that natural law underlay all of its functions and relationships. It is not surprising, therefore, that agricultural leaders had great confidence in the utility of statistics as a guide to progress. This is indicated by such statements as that of Isaac Newton in 1863: "Too much cannot be said in favor of agricultural statistics. They

²⁸ Quoted by Henry A. Wallace in a radio talk entitled: Seventy-fifth anniversary of the United States crop reporting Service, May 12, 1938, from the first crop report issued by the Department, July 10, 1863.

²⁹ U.S.D.A. Misc. Pub. 171, p. 3. See also U.S.D.A. Bul. No. 2, Synoptical index of the reports of the statistician, 1863-94, Government Printing Office 1897.

³⁰ Greathouse, pp. 15 and 18.

³¹ E. J. Moffet at \$2,500 per year with headquarters in London.

³² Greathouse, p. 38.

³³ *Ibid.*, p. 52.

form the key which is to unlock the hidden treasure of maturing nature or the chart which is to reveal to the husbandman and merchant the great laws of supply and demand—of tillage and barter—thus enabling both to work out a safe and healthy prosperity.”³⁴ Nearly three decades later essentially the same thought but containing a new phrase—the forecast idea—was expressed by Assistant Secretary Willits when he wrote: “If it is true as Comte says that the test of a science is its power of prediction, the highest order of economic science finds full play in the statistical division of the department.”³⁵

With this attitude among leaders of the last half of the 19th century, it is not surprising that the statistical functions of the department grew and that they came to include a good deal of what is now looked upon as agricultural economics. Jacob R. Dodge, who served the government in agricultural statistics for 24 years after his appointment in 1866, really was an economist for the department during much of his time. Dodge was a man of good judgment and he labored earnestly to connect the statistical material available directly with farm problems. He wrote volumes³⁶ and was aware of the basic problem of popularizing statistical material if it was to be made useful. He studied conditions in Europe and brought his conclusions to bear upon American problems. His efforts had a lasting influence not only upon agricultural statistics, but probably upon the Department of Agriculture as a whole. He believed that with adequate statistics the production of the farmers might be guided both as to the kind and the amounts of products and that with such knowledge the farmer could withhold his crops from the market until the prices promised to give him his greatest reward.³⁷ In short he looked upon the crop reports as revealing to the farmer the laws of supply and demand operating in his market and that these reports definitely served as a regulator of the markets so as to reduce price fluctuations.

As the frontiers expanded, and agriculture's output grew,

³⁴ Quoted by Cory from the Department of Agriculture Annual Report, 1863, p. 15.

³⁵ Quoted by Cory from the Department of Agriculture Annual Report, 1890.

³⁶ See Fugitive Writings of J. R. Dodge, clipping files, U.S.D.A. Library.

³⁷ Cory, p. 91.

transportation facilities also were improved. More and more the producer of a given commodity found himself in competition with all of the other producers of it. By looking up and down his own highway or viewing the conditions on neighboring farms, the farmer could see conditions in only a small part of the expanding realm of production—the entire output of which determined the price he was to receive for his products. To measure statistically the trends in so far-flung an industry as agriculture became more difficult as this industry grew both in size and complexity. It was much easier to ascertain the output of a group of mines or mills than of a group of farms representing the same value of investment or of product.³⁸ Uncertainty was looked upon as the mother of speculation. More dependable data, it was held, made for less uncertainty and hence less speculation.

The Development of "Forecasts"

Publication of crop condition figures over long periods led to quantitative interpretation of these data in the grain trade by the par method.³⁹ In 1906 the Keep Commission investigated the government work in agricultural statistics and recommended that the Department of Agriculture make forecasts of crop production. Official forecasts of production prior to harvest were begun by the Crop Reporting Board in 1912.⁴⁰ The decade after 1900 saw a sharply expanded government activity in this field and individual contributions became frequent. Technical progress and the rounding out of the data bodies have proceeded steadily especially in the past 30 years.

Because of many letters asking for farm price information, especially for seasonal prices, Nat Murray was led in 1908 to initiate the monthly farm price inquiries. This opened a vast field which has become one of the most useful in agricultural statistics. State agricultural statistics offices were established in 1914,⁴¹ and these too have revealed new horizons.

While the idea of forecasting for agriculture was already in the air, a little known incident in the winter of 1917 gave

³⁸ Hyde, John, U. S. Department of Agriculture Yearbook 1897, pp. 258 to 270.

³⁹ For a discussion of the par method see U.S.D.A. Misc. Pub. 171, pp. 23 and 24.

⁴⁰ See the paper by Nat C. Murray in this issue, and U.S.D.A. Misc. Pub. 171.

⁴¹ See Mr. Murray's paper in this issue.

it a new stimulus. For nearly three years the World War had raged, and when it became evident that soon the United States too would be involved, army officials visited Leon M. Estabrook and Mr. Murray in the Department of Agriculture and inquired about the probable crop of wheat that would come from the year's harvests. Since spring wheat was not yet planted, Mr. Murray could not give them a good answer but he agreed to send a questionnaire to farmers asking the acreage of spring wheat they expected to seed. After the returns from the inquiry were tabulated and the data given to the army men, Estabrook and Murray were so concerned over the adventure that the tabulation was concealed in the vault. But in the autumn when the clandestine record was again reviewed, the intentions-to-plant data had closely foretold the spring wheat acreage of that year.⁴²

Now, if an intentions-to-plant inquiry could foretell the acreage of spring wheat, why not predetermine the probable acreages of other crops, or the breeding intentions of livestock? In the disturbed years that followed, increasing demands for agricultural data, particularly information on what was likely to happen, led to the further development of this idea. Men's imaginations were touched by the incident and it expedited a series of events which brought intentions-to-plant and intentions-to-breed inquiries and finally the outlook reports.

For some years it had been suggested that the rural mail carriers make agricultural observations but whether these services could be used effectively was doubted. While the subject was under consideration at least as far back as 1913, it remained for W. F. Callander about 1922 to devise a schedule whereby the rural carriers collected information on livestock numbers and breeding intentions. This data source has since become the basis of much of the work in livestock and even crop acreage estimates. Perhaps the philosophy which lay back of the development of government forecasts in agriculture was well summarized by Henry C. Taylor then Chief of the Bureau of Agricultural Economics who had much to do with this movement. In 1923 he said: "While forecasts have always been made by farmers and merchants

⁴² This incident was related to the writer by Nat C. Murray.

and will continue to be made, it is believed that agricultural forecasting can be made more accurate by bringing to bear historical and statistical methods of collecting materials which will add to the accuracy of this forecasting. . . . Furthermore, knowledge of the intentions of others, who are simultaneously figuring on making readjustments, will improve the basis of passing judgment. The purpose of agricultural forecasting is the wise guidance of production in order that there may continue to be a proper balance between the various lines of production and between agriculture and other industries. . . . From the individual point of view, forecasting is the basis of wise farm management and marketing. From the national point of view it is the basis of a national agricultural policy."⁴³

The Development of State Work

After the establishment of agricultural statistics offices in the states, the way was open for an array of new services and a vast potential demand for local data. For the first time it was possible to undertake more detailed annual estimates in agricultural production by counties. When the state offices were but a few years old, new demands came as a result of the World War, and out of this period grew state and federal cooperation in the work. The first of such arrangements was developed in Wisconsin by W. F. Callander and C. P. Norgord⁴⁴ in 1917. All of the larger states now have cooperative agricultural statistics offices which serve both the state and the federal agencies.

As these cooperative units become more mature, they are able to supply demands for county statistics, state prices and index numbers, information on production and utilization of crops and livestock, as well as data on farm values and income from farm production. The closeness with which the preparation of these local data already has been geared into state functions suggests that probably much of the potential development in agricultural statistics henceforth

⁴³ Taylor, Henry C., an address on Agricultural forecasting, at Cornell University August 11, 1923, mimeographed.

⁴⁴ For further discussion of this early cooperative development see JOURNAL OF FARM ECONOMICS, 18: 123, and Wis. Dept. Agric. and Markets Bul. 187—Crop and Market Reports. Also U.S.D.A. Misc. Pub. 171.

will be in the state offices. Just as the work for the United States has gone through developmental steps, so the work in the states is likely to go through a series of growth stages. As yet many of the estimates published by states are not available by counties but the demands for these are urgent and numerous. Anyone confronted with this steady pressure cannot help but realize that these demands will become so insistent as to change further the present methods of making state estimates. Growth of cooperative work in agricultural statistics has opened the way for a policy of decentralization which has been in progress for more than a decade. State service requires that the data be available locally and as more of the work is lodged in the states their capacity to make the numerous "extensive researches" as they are needed, should grow. A state can initiate and test out inquiries where it would not be feasible to do so for the country as a whole hence states have become proving grounds for the new developments.

An important state contribution was the making of annual state and county farm income estimates. State estimates were developed by Joseph A. Becker in Wisconsin about 1920.⁴⁵ While this work has become national in scope, much remains to be done and one of the functions of the state offices will be the making of estimates of agricultural income by counties in order to meet the growing demand for them. Such income estimates are a logical end product of data on agricultural production, utilization, and prices, and to meet the needs they must eventually be made in the states and computed by counties.

Some Probable State Developments

In an inquiry sent to state statisticians, questions about the probable future development of the work were asked.⁴⁶ One of the striking things noted in the replies is the agree-

⁴⁵ Wis. State Dept. Agric. Bul. 34 by Joseph A. Becker.

⁴⁶ The following state statisticians replied to the inquiry: F. Andrews, F. O. Black, K. D. Blood, H. M. Brewer, A. C. Brittain, C. E. Burkhead, L. M. Carl, V. C. Childs, V. H. Church, H. L. Collins, F. Daniels, J. G. Diamond, E. L. Gasteiger, R. L. Gillett, E. V. Jones, M. M. Justin, B. U. Kienholz, P. H. Kirk, G. Knutson, H. A. Marks, S. T. Marsh, G. L. Morgan, F. Parker, E. C. Paxton, F. K. Reed, R. C. Ross, H. H. Schutz, G. A. Scott, C. D. Stevens, H. C. R. Stewart, A. J. Surratt, and H. M. Taylor.

ment which seems to exist among the men as to the types of data for which there is the greatest demand at present. Wide use is already being made of the improved data on general crops and livestock which have been developed since the World War, as well as of the data on fruit and truck crops, farm prices, and dairy and poultry statistics. Based on demands now felt in the states, there is a widespread need for county statistics of many types, but particularly acreage, yield, and production figures for crops, numbers and disposition of livestock, as well as dairy and poultry data by counties and county estimates of crop and livestock values and farm income. Considerable demand exists for agricultural prices by districts, and price indexes which the Agricultural Marketing Service is offering and price data published in the state offices are widely used. More interpretation of the data is needed and for most states more extensive and detailed publication seems imperative.

While demands for data vary somewhat in different parts of the country, it is clear that everywhere there is an increasing demand for more detailed statistics and for more interpretation of the data. In order to meet these demands, a broad program embracing well-rounded data bodies covering the full range of the field must be contemplated in the state offices.⁴⁷ More and more the data on agriculture are found useful in making decisions and policies, market analysis, research, etc., and as the data are improved the range of uses becomes wider.

Schools,⁴⁸ government agencies, and organizations of many kinds are making more and more use of detailed as well as general statistics.⁴⁹ Increasing cooperation between the Census and the Department of Agriculture is developing, but the work of these two agencies must be more and more coordinated if the growing demand for all sorts of data by states and counties is to be met. To meet these growing re-

⁴⁷ The United States Census Bureau is asked to include about three times as many questions on agriculture as can be carried on the schedule. The sampling technique employed in crop reporting could get adequate answers for many of them.

⁴⁸ For a discussion of the use of census material see Z. R. Pettet in *School Life*, by the U. S. Department of the Interior, 22, No. (5): 141-142. 1937.

⁴⁹ For a list of the additional detailed data wanted on fruit and truck crops in one state alone see Chester C. Du Mond's report to the Annual Meeting of the New York State Farm Bureau Federation, November 1938, mimeographed.

quirements, series of publications from state statistical offices are gradually emerging. For the immediate future these seem likely to group into four general types:⁵⁰ (1) Monthly bulletins and special reports with current data on crops, livestock, farm prices, markets, and other developments; (2) general summary bulletins with county data and state summaries showing long-time trends and general state statistics, published annually or at longer intervals; (3) special statistical bulletins covering leading fields of state interest, such as fruit or truck crops, poultry, dairying, etc.; (4) bulletins for counties or groups of counties showing agricultural trends and statistics for these smaller areas. Unified efforts in collecting and interpreting agricultural data combined with adequate and timely publication have become essential to meet in their present form the needs which for a century have underlain the growth in this field.⁵¹

⁵⁰ The manner of issuing agricultural data varies among the states. For Wisconsin examples of the four types of publications are: (1) The monthly, Wisconsin Crop and Livestock Reporter. (2) Bul. 188, Wisconsin Agriculture issued by the State Department of Agriculture, Madison. (3) Bull. 176, Wisconsin Poultry, and Bull. 200, Wisconsin Dairying, by the State Department of Agriculture. (4) A partly published series of county agricultural statistics bulletins on which work was begun in 1934.

⁵¹ The author wishes to acknowledge assistance in this survey of the development of agricultural statistics in the United States from W. F. Callander, Agricultural Marketing Service, Z. R. Pettet, U. S. Census Bureau; Walter T. Borg and E. E. Edwards, Bureau of Agricultural Economics, and others.

DEVELOPMENT OF AGRICULTURAL STATISTICS IN THE BUREAU OF THE CENSUS¹

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IN THE Census Act of March 3, 1839, the Congress of the United States directed that "the aforesaid marshals and their assistants shall . . . also collect and return in statistical tables, under proper heads, . . . all such information in relation to mines, agriculture, commerce, manufactures, and schools, as will exhibit a full view of the pursuits, industry, education and resources of the country as shall be directed by the President of the United States." In ordering this first large-scale collection of agricultural data it is safe to assume that the Congress had little conception of the magnitude of the task it set or of the vast collections of data that would later grow out of these humble beginnings.

From this initial undertaking, through gradual evolution, through the lessons of experience, through the piling of demand on demand, and through the counseling, scolding, striving, and encouragement of statisticians, the world's largest primary data-gathering organization has reached its present stage of development. In the main its growth has been gradual, the changes of direction and tempo unsensational. Yet important changes have occurred from time to time, often hardly recognizable when they occurred, but bulking large when viewed with the perspective of later years. Statistical resources and mechanisms that would have seemed more than ample a generation ago are now regarded critically, sometimes even scornfully, in these days of huge administrative undertakings, widespread research activities, and ever-growing demands for quantitative data. Men come to regard themselves as overwhelmed in a statistical inundation or suffering from gross inadequacy of primary data, depending on whether they are on the giving or the receiving end of this vast flow of figures.

The Congress which ordered the collection of all such in-

¹ Giannini Foundation Paper No. 82.

formation in relation to agriculture as will exhibit a full view of the agricultural resources of the country had in mind just that and nothing more. It little dreamed of a great crop and livestock reporting service basing its estimates on these census returns; it would have gasped at the idea of an agricultural schedule such as that of 1930 which carried 233 inquiries; and would have been flabbergasted at a proposal to use census data for determining how many acres a farmer should be allowed to crop. Yet these and a thousand other innovations and uses have come into the census picture since that time.

Only in barest outline can the developments, the controversies, and the achievements of such an undertaking be sketched in the space of a brief article such as this. Discussions of it in the various historical treatises, in journal articles, and in publications of the census organization itself have already reached large proportions. The early stages of agricultural census work are, to be sure, water over the dam and not of major importance in present-day considerations. It seems necessary, however, in reviewing the more pertinent census history of recent decades to sketch at least in outline the evolution of this phase of census activity before turning to the principal issues of the last two decades.

There are already available two very readable and comprehensive historical studies of the census as a whole, that of Wright and Hunt published in 1900 and that of W. Stull Holt published in 1929.² A more analytical but semi-historical treatise by Samuel A. Stouffer appeared in a recent report of the National Resources Committee.³ In the main, discussions of the Census which have appeared in the various journals have had to do with specific problems rather than historical aspects. Some of these are mentioned in later sections of this article.

In the first inquiry, that of 1840, 37 inquiries were listed. These called merely for quantities produced under the crop

² Carroll D. Wright and William C. Hunt. *The history and growth of the United States Census*. Washington, D. C. United States Government Printing Office, 1900.

W. Stull Holt. *The Bureau of the Census, its history, activities, and organization*. Washington, D. C. The Brookings Institution, 1929.

³ Samuel A. Stouffer. *Problems of the Bureau of the Census in their relation to social science*. Report of the Science Committee of the National Resources Committee. Washington, D. C. Government Printing Office, 1938.

headings, and these only as totals by districts, not by individual farms. Livestock numbers were called for, however.

As a result of criticisms of the 1840 Census presented by the then youthful American Statistical Association and other agencies, a serious effort was made to improve the 1850 enumeration both as to population and agriculture. Experienced statisticians were called into consultation, and a more adequate plan was submitted. The number of inquiries in the agricultural census was increased to 46,⁴ and a separate schedule which provided for entering the name of the operator of the farm was used. Also there was developed a specific set of instructions for the United States marshals and assistant marshals who were to take the census. Here also we find the beginning of the vexing and much discussed problem as to what shall constitute a farm.⁵ In 1860 the number of questions listed was 48 and in 1870, 52. Except for livestock items the inquiries were still in terms of amounts produced and did not call for acreages.

Not until 1880 was there an important change in the census program. The 1880 enumeration was taken under the able leadership of General Francis A. Walker who was not only well fitted for the task but had also the advantage of having superintended the Census of 1870 and having had more or less continuous contact with census activities during the intercensal period.⁶ Considerable improvement was made in the legislation providing for this enumeration and it represents a landmark in census history.

The weakness of the field organization for taking census enumerations had long been recognized. This together with the lack of permanence of office and staff had been matters of adverse comment both within and outside the census for decades when legislation for the 1870 and 1880 Censuses came under consideration. The marshals were responsible in many

⁴ Including name of operator.

⁵ The definition given is as follows: "The returns of all farms or plantations the produce of which amounts to \$100 in value are to be included in this schedule; but it is not intended to include the returns of small lots owned or worked by persons following mechanical or other pursuits where the productions are not \$100 in value."

⁶ Although General Walker had remained in office as Superintendent of the Census only until November 1871, he was at that time appointed Commissioner of Indian Affairs and continued to supervise the compilation and analysis of the census returns. The lack of appropriations had prevented his being continued as Superintendent of the Census beyond November 1871.

cases for enumeration of areas much too large, considering the rudimentary transportation and communication conditions of that period. Few of them had any but a minor interest in census taking, and their assistants were appointed in the main without any kind of test for competency. Political influence bulked large in their selection. They had functioned particularly badly in the Census of 1870, especially in the southern states.

Remedial legislation gained acceptance in the House Committee on the Census in 1869 but failed of passage at that time. Pressure for reform of the census had, however, reached a sufficient pitch by 1879 so that the act passed in that year made far-reaching changes in census organization and procedure. The position of Superintendent of the Census was definitely established as an office headship in the Department of the Interior. Field work was taken out of the hands of the United States marshals and provision made for the appointment of supervisors chosen specifically for the census work. These to a number not exceeding 150 were to be appointed by the President with the advice and consent of the Senate. The numbers to be appointed for each state and territory were to be determined by the Secretary of the Interior, but each state was to have at least one.

This was the most significant change in field organization in the history of the Census, and, with certain modifications in arrangements for appointment of supervisors and numbers permitted, provides the main framework of the present field organization. This act of 1879, in which the influence of General Walker is clearly evident, sought to lessen the influence of political connections in the selection of enumerators. Although the mechanism adopted was inadequate to achieve this end it nevertheless marked an important step forward and was probably as much of an improvement as could have been carried through Congress at that time.

In the 1880 Census we also find introduced such innovations as acreages of crops grown, tenure status of operator, land utilization questions, and some additions to expenditure and income data.

Relationship of Agricultural Census to Crop and Livestock Estimates.—During the 40 years preceding the Census of

1880 there had been a rudimentary development of annual crop estimates outside the census. With the creation of the United States Department of Agriculture in 1862, this work was taken over from the Patent Office where it had been carried on since 1839. From 1866 to 1881 such data were collected on a small scale through county reporters. By 1882 this work reached a stage where part-time state reporters were appointed and these men began to build up small lists of voluntary crop correspondents. The Census of 1880 for the first time provided the base data on crop acreage which made possible a fuller development of crop reporting activities.⁷ As this type of reporting grew in scope, prestige, and importance, the census of agriculture took on a new value different in type from that which had been visualized at the time of its initiation.

Estimates by the Crop Reporting Service had a very definite and immediate relationship to marketing and market prices, a connection that has grown stronger with the years. In recent decades this agency has come to be one of the most comprehensive and authoritative sources of current crop and livestock data, certainly in the United States if not in the world at large. On its reports rest trading operations involving hundreds of millions of dollars. The mechanism by which these reports are produced consists of a sampling and estimating procedure built upon an enumeration base. Timely current estimates on crop acreages and yields are possible because of the existence of a periodic collection of base data through the method of enumeration. There is thus in this realm a division of labor between the census and the Crop and Livestock Reporting Service which consists of a difference in method rather than of purpose. Census figures continue, of course, to have their general purpose uses as before, but their uses in crop estimating constitute one of the major evolutionary developments in agricultural census work, and probably now overshadow in economic importance the purposes visualized when this work was started. A second major change in use of these data has come into being in the present decade and will be discussed later.

⁷ For fuller discussion of this see *The Crop and Livestock Reporting Service of the United States*. U. S. Dept. Agr. Misc. Pub. 71. pp. 3-5.

Experiments With Greatly Overloaded Schedules.—The agricultural censuses of 1880 and 1890 were expanded enormously. Not only was the number of inquiries on the regular schedule of 1880 expanded to more than 100 from the 52 in 1870, but innumerable special schedules were also added calling for almost every conceivable type of information about cultural practices, kinds of soil, varieties grown, etc. This increase in the general schedule was mainly the result of including acreage figures for the crops. Prior to this time only amounts produced had been asked for. The special schedule on production of cereals alone carried 143 questions. Inquiries relative to cotton culture ran close to 200 if all items are counted. In addition there was a long series of questions on forest products, not less than 100 in all. To these were added some hundred or more questions on fruit growing, another 77 on hops, two or three hundred on livestock and another 150 or more on tobacco.

In reviewing the inquiries listed in these enumerations one is tempted to query whether agricultural researchers were not seeking to obtain answers to most of their research problems through questions hurled at the helpless victims of the census taker.

These enumerations illustrate the *reductio ad absurdum* to which census taking can go if the pet questions of all agencies and individuals are included without discrimination. For example, we find in the livestock inquiries such questions as these:

"Are the pastures and ranges temporarily or permanently injured by sheep grazing?"

"What are the botanical and popular names of the prevailing grasses, and what are their characteristics and relative values as feed?"

"How is abortion best prevented?" and as question 14 in the section on hog raising, "Finally, will you have the kindness to give an outline description of the average manner of rearing hogs for market in your section?"

This extreme example of overloading of the census with impractical and unwarranted inquiries was a forerunner of the periodic battles of recent years to hold schedules within manageable proportions. The results were, of course, disappointing to all concerned.

The agricultural census of 1890 was again loaded with an excessive number of special inquiries, though not in such extreme measure as that of 1880. Here for the first time a comprehensive census of irrigation was undertaken, a result no doubt of the very active irrigation development which was going on in the west at that time. There was likewise a new special schedule on nurseries, one on seed farms, one on tobacco, one on tropic and semi-tropic fruits, one on viticulture, and one on soils, irrigation, drainage, meteorology, fertilizers, etc. Nearly all of these special schedules carried questions which the questionee could not answer intelligently, and sufficient in number to have exhausted the patience of Job. In the meantime, however, the main regular schedule had been developing in a relatively orderly way and did not at that time carry an unwieldy number of inquiries.

Recognizing that the enumerations of 1880 and 1890 had included too many questions, Congress took the matter in hand, and, in the Census of 1900 restricted the inquiries to those "relating to the population, to mortality, to the products of agriculture and of manufacturing and mechanical establishments." The act stated that "The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of livestock."

Census procedure in the Census of 1900 was not greatly changed from that of the two preceding enumerations though the powers of the Superintendent, now designated the "Director of the Census," were somewhat increased. Provision was made for a noncompetitive examination for all employees except enumerators, and special agents, but the arrangement was not effective in eliminating political influence. In this census for the first time electric machines were used in tabulating part of the agricultural data. The machines then in use, however, still left much to be desired in accuracy and effectiveness.

Establishment of Permanent Census Office.—With the act of March 6, 1902, came the development which had been

advocated for half a century or more by census officials and professional statisticians; namely the establishment of a permanent census office. For the first time it became possible to provide continuity in the professional staff and more adequate advance preparation for the enumerations. The Census Office, at first established in the Department of the Interior where it had been carried as a temporary office for more than half a century, was almost immediately transferred to the newly created Department of Commerce and Labor. Provision was made not only for the Secretary of that Department to rearrange the statistical work of the divisions under his control by transfer to the Census Office, but the President was also given power to transfer statistical work to the Department of Commerce and Labor from any of the other departments except agriculture. It thus appears evident that Congress contemplated considerable centralization of statistical activity in the newly created Census Office. There was little of such transfer, however, and the Office continued to be concerned mostly with the traditional census types of work.

The Census Office was organized along general lines similar to those now in effect, with the following divisions: Population, Manufactures, Agriculture, Vital Statistics, and Methods and Results, later called Revision and Results. Another new division had been created shortly before; namely, that of the geographer. This phase of the work has grown in importance with the years since.

A new duty with respect to agricultural products was the provision for collecting annual data on cotton production from the ginner. This has afforded an independent check on the estimates for this crop by the Department of Agriculture.

During this intercensal period the Census took over into its own shops the task of developing and refining the machinery for mechanical tabulation and by 1910 had brought these to a higher stage of dependability and usefulness.

Enumerations of 1910, 1920, and 1925.—In the Census of 1910 the inquiries to be carried on the schedule were again prescribed in the act itself, and did not differ greatly from those specified for the preceding census. Such legislative pro-

visions with respect to items to be covered continued until the agricultural census of 1925. While Congressional action along these lines relieves the Director of a heavy responsibility, it tends to keep the schedules unduly rigid, and may easily result in organized pressure groups forcing into the schedule through congressional action items which are known to be less valuable than others which are thereby necessarily omitted. Discretionary action by the Director in so important a matter virtually forces the Bureau, in self-protection, to develop some type of professional advisory arrangement. Provision for professional advice on the make-up of schedules has become rather extensive and complex in recent enumerations, but on the whole appears to be a desirable means both of getting an informed and representative judgment on the relative merits of various inquiries and of providing a needed spreading of responsibility so as not to focus too sharply on census officials the disapproval of those whose pet questions for one reason or another cannot be included.

Dr. E. Dana Durand became Director of the Census on July 1, 1909, and shortly thereafter called in a special advisory committee which included Dr. T. N. Carver, Dr. John Lee Coulter, Dr. H. C. Taylor, and Dr. G. F. Warren. This committee spent some two months in Washington working on the agricultural schedules and planning the forms of tabulation. Drs. Taylor and Warren again aided in the plans for the 1920 Census. From 1919 onward there has been a close though relatively informal cooperation between the Bureau of the Census and members of the staff of the Department of Agriculture. This relationship has contributed materially to the improvement of the agricultural censuses since that time. In plans for the 1910 enumeration special attention was given by the agricultural economists to clarification of the plantation and cropper phases of the census and to improvements in the procedure for editing and tabulating. The closer cooperation with the Department of Agriculture resulted also, particularly through the efforts of Dr. C. J. Galpin, in the inclusion of more data on farm population, and in a growing concern with data by smaller geographic units. In the 1925 Census the state statisticians of

the Department of Agriculture served as district supervisors of their home districts in nearly all states.⁸

In developing plans for the Census of 1920 the Bureau had the advice on problems of method and technique of an outside advisory committee nominated by the American Statistical Association and the American Economic Association. This committee consisting of C. W. Doten, E. F. Gay, W. C. Mitchell, W. S. Rossiter, E. R. A. Seligman, and W. F. Willcox counseled on all phases of the enumeration. It was the beginning of the more elaborate advisory system which has developed in recent years. Earlier committees had functioned on specific problems, and had discussed the census work but not under so definite a cooperative arrangement. This development marked a step forward in closer relationships between the Bureau and these professional associations.

In the enumeration of 1920 provision was made for securing data on mortgage debt and for including drainage along with irrigation. In this enumeration the data on agriculture and manufactures were for the first time completely tabulated on punch cards using the newly developed electrical tabulating machines.

The mid-decennial census of agriculture in 1925 was a new departure which had been advocated and in fact enacted into law as early as 1910, but not made effective until now. The widespread interest among farmers, during this decade, in the possibility of legislation to relieve their distress; the rapidly developing interest in statistical analysis among agricultural economists, and the disturbed production conditions growing out of the War period all combined to stimulate the demand for a more frequent enumeration. This was the first attempt to take an agricultural census without an accompanying census of population and, through that difference, certain problems were uncovered which have since given rise to considerable discussion in the economic journals.^{9,10}

⁸ The contributions by agricultural economists to the development of the census of agriculture during this period do not appear in available published material. It is to be hoped that some member of the group mentioned above will present in some other connection a more adequate record of this period in census history.

⁹ The act providing for the Census of 1910 specified for the first time that a quinquennial census of agriculture be taken in 1915 and every ten years thereafter. This provision was repealed, however, at the time appropriations would have been necessary to bring it into effect. (Cont'd on next page.)

The Census of 1930.—The act governing the 1930 Census omitted specification of the inquiries to be included thus leaving to the Director of the Census both more discretionary power and more responsibility. The act also omitted forestry and forest products and quarries. The arrangements for the agricultural enumeration at this census were the most carefully worked out of any up to that time and were more thoroughly gone into than those for any enumeration except that of 1940 which is about to be taken.

Dr. F. F. Elliott, in an article in the *JOURNAL OF FARM ECONOMICS* for January 1931, summarizes major innovations of the 1930 Census of Agriculture as follows:

"The same tendency to expand the scope of the Census manifested so many times in the past continued in the 1930 Census. . . . More than 2,000 requests for additional inquiries were received. After numerous conferences it was finally decided to confine the enumeration to 16 schedules: the general farm schedule; 2 supplemental schedules for fruits and nuts; 2 schedules for incidental agricultural production and livestock, poultry and bees not on farms or ranges; 2 special schedules for sheep for use in 13 western states; 2 schedules for irrigation; 1 schedule on drainage and 6 schedules on horticulture.

"The general farm schedule includes a total of 233 inquiries, making it the most comprehensive which has been undertaken up to this time. . . .

"Probably the most significant . . . new inquiries relate to the value of products sold. A series of questions were included with the

In 1913 when a special committee was striving to find ways and means for bringing the work of the Census Bureau up to date and to bring to a close the work on the Thirteenth Census it recommended discontinuance of the annual reports on the production of lumber, lath, shingles, and other forest products which had been carried since 1906. This work was taken over in part by the Forest Service but was again resumed by the Bureau of the Census beginning with the year 1922.

In July 1914 the Division of Agriculture was merged into the Division of Statistics of Cities and was not restored to the status of a separate division until 1917 when work was begun on preparations for the Fourteenth Census. In this same year a new division known as Cotton and Tobacco was created. By an act of Congress in January 1929 the collection of tobacco statistics was transferred to the Department of Agriculture.

The 1920 Census had added new inquiries on Farm Drainage and on Cooperative Marketing. In the 1925 enumeration the inquiries on drainage were omitted but an inquiry on Farm Taxes was added.

¹⁰ From 1925 onward the Department of Agriculture has furnished unit prices for calculating value of production for censuses of agriculture. This has simplified the problem of schedule construction and also has resulted, in this realm, in a combining of enumerative and sampling procedures since the Department of Agriculture price data are collected by a sampling technique. The cooperative arrangement has, on the whole, been very satisfactory to both agencies.

view of obtaining the amount of money received from the sale of the various crops, livestock, livestock products, forest products, the estimated value of the products of the farm consumed by the farm family, and the receipts from boarders, lodgers, campers, etc."¹¹

The data on income thus obtained made possible and resulted in the important monograph "Types of Farming in the United States" which was later prepared by Dr. Elliott and was issued by the Bureau of the Census in 1933.

Another departure of the 1930 Census was the publication for the first time of certain basic data by minor civil divisions. This was much desired by students of land utilization and types of farming, but presented a number of difficulties from the standpoint of the Census, one being, of course, a considerable increase in expense, another the difficulty of handling data for farms that extend across township lines.

Other new features, as summarized by Elliott were the inclusion of "inquiries on purchases and sales of livestock, number of cows of beef or dual purpose breeding milked in 1929, cows milked daily and daily milk production, daily egg production, baby chicks bought, turkeys, geese and ducks raised, . . . acres and quantity of durum wheat harvested, acres in sweet clover pasture, and acres in corn, spring wheat, and winter wheat planted or to be planted for harvest in 1930." Other changes involved attempts to separate irrigated from nonirrigated crops grown on farms reporting irrigated land, and to secure data on forest products cut on farms, expenditures for electric light and power, farm machinery, and commercial fertilizer, and numbers of days of labor hired.¹²

¹¹ Elliott, F. F. The 1930 Census of Agriculture—new features and uses, *Jour. Farm Econ.* January 1931, p. 113. Some income questions had been carried in earlier censuses, but the coverage was much more complete in the 1930 enumeration.

For further comment both on new features of the 1930 Census and procedure in making the farm type classifications see Dr. Elliott's article cited above and the Census Monograph: Types of farming in the United States. Washington, 1933.

For an appraisal of the livestock data secured by the 1930 Census see article by C. L. Harlan: Interpretation of the 1930 census of livestock on farms. *Jour. Farm Econ.*, July 1932, pp. 453-469.

¹² The coverage by the 1930 Census is also discussed in considerable detail in an article by William Lane Austin, "The Census of Agriculture," in the March 1930 Supplement of the *Journal of the American Statistical Association*, pp. 130-134.

For lack of space no mention has been made of the Census of Manufactures and of Distribution, both of which provide considerable amounts of data pertaining

The "New Deal" and Changing Demands for Agricultural Data.—The Roosevelt administration which came in in March 1933 brought with it a vast upheaval in the statistical work of the federal government and affected the Bureau of the Census in many ways. So far as the Census of Agriculture was concerned it marked a new turning point in ways of using the data and a new emphasis on acreage and production data by minor civil divisions. The measures looking to planned use of agricultural lands and to regulation of crop production brought unprecedented demands for agricultural data and a far more critical attitude with respect to the data gathered by the census than had ever prevailed before.¹³ This shift in emphasis marks the second major change in purposes to be served by the agricultural census data.

The time for taking the 1935 Census of Agriculture came in the midst of greatly disturbed conditions. Despite the fact that the act providing for the Fifteenth Census, like those providing for the Fourteenth and Thirteenth Censuses had made specific provision for a mid-decennial census of agriculture, there was considerable doubt until shortly before work began on this enumeration whether funds would be provided for it. This doubt arose from several factors in the situation: (1) heavy demands for funds in the newer agencies

to agricultural products. The Census of Distribution, now known as the Census of Business, was first undertaken in 1930. This is described in an article by Charles D. Bohanon, "The First Census of Distribution, with Especial Reference to Its Possible Contribution to State and National Agricultural Policies and Research." Proceedings of the 44th Annual Convention of the Association of Land Grant Colleges and Universities, 1931. This census is also described by Robert J. McFall in "The Census of Distribution," Journal of the American Statistical Association, Supplements of March 1928 and March 1930, and in an article of the same title in that journal, March Supplement, 1933, by Dr. Melvin T. Copeland.

In commenting on the 1930 Census of Agriculture attention may well be called to the fact that this date marked the undertaking of the First World Agricultural Census under the general guidance of the International Institute of Agriculture at Rome. The experience and methods developed in the agricultural censuses in the United States undoubtedly had a strong influence on the plans adopted for this world-wide census undertaking.

¹³ Early in 1934 the Director of the Census requested the Central Statistical Board to make a study of the work and organization of several divisions in the Bureau of the Census. The Division of Agriculture was one of those designated. The Committee on Government Statistics and the Civil Service Commission cooperated in these studies. Most of the conclusions and recommendations resulting from these studies are in the form of confidential memoranda for internal use. Brief reference to these studies appears in Bulletin 26 of the Social Science Research Council, A Report of the Committee on Government Statistics and Information Services, and in the First Annual Report of the Central Statistical Board, Washington, 1935.

and some uncertainty as to the extent to which these agencies might secure through their own representatives much of the needed information; (2) dissatisfaction with the results of the mid-decennial Census of 1925; (3) unprecedented drouth conditions through large areas in the West which raised considerable doubt as to the value of such data as might be collected. However, by an act approved on April 7, 1934, an appropriation of \$2,270,000 was made available for the enumeration to be taken as of January 1, 1935. To this were added other funds, in part supplied by the Department of Agriculture from its drouth relief funds and in part provided through supplemental appropriations, to make a total of somewhat over \$5,000,000. This was enough to provide for a limited census but not enough to allow for anything like the scope of the recent decennial censuses which involved use of some \$10,000,000 on the agricultural enumerations.

The 1935 Census was preceded by more discussion than any previous agricultural enumeration, at least so far as published comments are concerned. Not only had considerable interest been aroused by such articles as those by I. G. Davis and John D. Black, mentioned elsewhere, but also from the emergence of many new demands arising out of vastly enlarged federal action programs. A symposium on agricultural census problems was arranged for the 1933 meeting of the American Farm Economic Association. This resulted in three papers published in the *JOURNAL OF FARM ECONOMICS* for July 1934.¹⁴

The second mid-decennial census appears to have been relatively good for the items covered.¹⁵ Mr. Joseph A. Becker, of the Division of Crop and Livestock Estimates, comments

¹⁴ Tolley, H. R. and J. D. Black. The administrative use of agricultural census and intercensal data.

Black, John D. The coming agricultural census enumerations.

Benedict, Murray R. Agricultural statistics viewed in the light of a changing agricultural program.

¹⁵ No mention can be made here of the numerous publications issued during recent years in connection with the Census of Agriculture. One of these, however, the Descriptive supplement, technique of tabulation, by Z. R. Pettet, issued in 1937, should be mentioned as of special interest to students interested in tabulating technique. The 1935 Census also, for the first time, included a volume on Part Time Farming, though certain subclassifications under that heading had been included in the type-of-farming volumes for 1930.

as follows in an article in the JOURNAL OF FARM ECONOMICS for February 1936.

"In general the present census appears to be substantially more complete and more reliable than previous enumerations. It includes many more small farms and it is probably more complete in areas where there is some question as to whether individual properties are farms or not. It probably includes a larger proportion of the marginal farms not actively in operation than does the 1930 census and in some states at least it seems to include a larger number of farms in areas where much of the land is in woods. Because of the much shorter schedule, the 1935 census is unusually complete on minor crops and smaller acreages.

"The changes in assigned date from April 1 to January 1 made it easier for enumerators to secure records in areas where many tenants move in the spring. In some northern and mountain areas the winter season was unfavorable for getting to all the farms. Improved roads and transportation facilities may have offset this disadvantage to a considerable extent.

"The more intensive training of state supervisors has no doubt improved the quality of the enumeration in numerous details. Somewhat more than the usual recourse by the central office officials to check data from outside sources tended toward better editing and checking of the tabulations."

Proposals for Reorganization of Census Work.—Following the completion of the 1935 enumeration the Bureau of the Census in cooperation with the Department of Agriculture began work on plans looking to a far-reaching reorganization of the agricultural census work along lines that had been foreshadowed in legislative proposals and studies made by the Department of Agriculture over a period of nearly ten years preceding this time. These modifications took shape in a draft bill designed to be put forward for the Sixteenth Census soon to be taken. While the draft bill proposed other important changes in census activities, including a much needed staggering of the various phases of the work and improved arrangements for continuity of the regular work of the Bureau, only the agricultural aspects of the proposals will be discussed in this paper.

During this period a change had been made in the general advisory work of the Bureau. Since 1917 there had been in existence an advisory committee to the Director consisting

of six men, three nominated by the American Statistical Association and three by the American Economic Association. With the appearance and growth of a number of newer professional associations having interests in statistical work, the arrangement described above seemed not well suited for representation of the various technical skills and points of view. At the close of 1936, through agreement between the American Statistical Association and the American Economic Association, it was arranged that the American Statistical Association, which represented more or less common ground for all types of statistical interest, would nominate all members of the advisory committee, having in mind both technical qualifications to advise on various phases of the census and representation of various types of interest and connection.¹⁶ This committee has met three to four times per year, and worked in close cooperation with the Director on technical, legislative, and policy matters.

The legislative proposals which grew out of the long series of conferences and studies by the Bureau and the Department of Agriculture represented undoubtedly the most advanced and carefully thought out legislation yet devised for census taking. Unfortunately the proposed legislation encountered serious difficulties in the Budget Bureau and was so extensively changed and emasculated that it was felt best not to press it for further consideration. As a result the Sixteenth Census comes automatically to be taken under the provisions of the act of 1929 which was a continuing act.

Recent Controversial Issues in Agricultural Census Work.—With this very brief and general survey of development through the years we may now turn back to more detailed consideration of certain problems and controversial issues. Most of these, in their most acute form at least, have arisen during the past two decades as the broader and more precise uses of census data have come to the fore. Without attempting appraisal of relative importance or even completeness,

¹⁶ Through this arrangement the committee has consisted during the past few years of one member with a primary interest in vital statistics and population problems, three with major interest in economics of business, one sociologist and one agricultural economist. During this time the secretary of the American Statistical Association has participated by invitation in nearly all sessions of the advisory committee.

the following may be mentioned as prominent among these issues: (1) the date for taking the enumeration; (2) the annual sample census and the sampling issue in its broader aspects; (3) completeness of coverage particularly with respect to small units; (4) the problem of farm definition, including in its broader aspects the method of handling cropper units, plantations, and small farms; (5) the method of conducting field work; (6) the make-up of the schedule including such matters as suitable representation of the interests of various groups, continuity versus change, social data as well as physical data, etc.

While there has been a long and intimate contact between the Census and the American Statistical Association and various criticisms of census results appear in the journal of that association from time to time since its beginning, critical analysis of the agricultural census dates almost wholly from about 1930, and will in the main be comparatively familiar to readers of this article.

Date of Enumeration.—One of the problems which has grown in importance with the increase of farm tenancy and with the refinement of crop and livestock reporting procedures is that of the date of taking the enumeration. The first four enumerations of population, 1790, 1800, 1810, and 1820, were taken as of the first Monday in August. With the Census of 1830 the date was moved forward to June 1 and remained there until the 1910 enumeration. At that time the date was again advanced, to April 15. For the 1920 Census the date was fixed at January 1 and this date was again used in 1925. For 1930 the date was again changed, this time to April 1. The 1935 Census was again taken as of January 1, but for the Census of 1940 the date has been dropped back automatically to April 1 since this census is to be taken under the act of 1929. In the last session of Congress strong representations for a return to the January 1 date were made by agricultural interests, and seemed to give some promise of success, but with the development of a bitter congressional struggle over neutrality and the spending and lending program, the bill making the change failed of passage.

As to the agricultural census the case for some date earlier than the spring is clear and indisputable. The population

aspect is more controversial, and it is this rather than the agricultural interest which has been the chief factor in congressional decisions about the matter. The objections by agriculturists to the spring date are several. First and probably the most important is that nearly a third of the nation's 2,800,000 tenant farmers occupy, in the spring, farms other than those they farmed in the previous year. Since they are called upon to report for the farms occupied at the time of the enumeration it is evident that they must make returns for farms they do not know intimately. Secondly, the spring date breaks into the middle of the period of most active reproduction in livestock and makes extremely difficult the establishment of comparable data on livestock numbers. Furthermore, it strikes an active period in farm work when farmers are reluctant to give time for filling a long and complicated schedule. A further difficulty is that arising from memory bias.

Agriculturists would greatly prefer a fall date in the preceding year, possibly November first or somewhere near that time, but in view of possible objections on constitutional grounds to a date outside the decennial year and the known objection to shifting from the spring date, they have been willing to compromise on January 1. In the 1929 legislation the fall date gained sufficient support to secure passage in the Senate but was lost in conference. Congressional sentiment with respect to the matter has been influenced considerably by the seasonal movements of population from one area to another, each Congressman desiring a date when his area will be at its maximum of population. Also the January 1 date has at times presented considerable difficulty because of adverse weather and highway conditions. This handicap is no doubt becoming less with the rapid improvement in highways and methods of communication that have occurred in recent years. It is evident that this problem of date of enumeration must be met and solved. A satisfactory census of agriculture cannot be taken in the spring. The recent situation with continually changing dates is probably even worse than the continuous use of a bad date. Unless a more satisfactory date for the whole enumeration can be secured there is almost certain to be sooner or later a separation of the agricultural from the population enumeration.

Annual Sample Census.—The idea of an annual sample census has long been in the minds of the Department of Agriculture officials interested in improving the accuracy of the estimates released by the Division of Crop and Livestock Estimates and in securing a larger volume of other data than can be carried on the regular census schedule. This first took form in a bill known as the Buchanan bill which was introduced in 1926 and in several succeeding sessions of Congress but has thus far failed of passage. This provided for annual enumerations in certain minor civil divisions, these to be both taken and tabulated by the Department of Agriculture. During the past ten years considerable study has been given to possible sampling procedures in taking such data and to the representativeness of the data which might arise therefrom.¹⁷ These studies have developed much valuable preliminary information about this procedure, and have also led to a somewhat less confident and more critical attitude with respect to the results that could be obtained in this way.

In a series of conferences between the Bureau of the Census and the Department of Agriculture in 1938 a plan was developed whereby a joint annual sample census in agriculture would be undertaken, the field work being done by the Department of Agriculture, the tabulation and publication being done by the Bureau of the Census. This plan, much the most carefully worked out of any so far proposed, was abandoned along with the other improvements proposed in the tentative draft bill for the Sixteenth Census when that draft was withdrawn from consideration.

Completeness of Coverage.—During recent years the problem of completeness of coverage has come increasingly under scrutiny. This has been due in considerable measure to the

¹⁷ See for example, C. F. Sarle, Methods in sample census research, Jour. Farm Econ., August 1938, pp. 669-672 and Dallas W. Smythe, A technique for regionalization of agricultural census schedules, *Ibid.*, pp. 672-677.

Note also, proceedings of conference on statistical methods of sampling agricultural data, Mimeo., Bur. Agr. Econ., Washington, 1936.

This problem together with certain other aspects of census work is also discussed in an earlier publication by C. F. Sarle, Adequacy and reliability of crop-yield estimates, U. S. Dept. Agr. Tech. Bul. 311, Washington, 1932.

See also, Development of partial and sample census methods, by C. F. Sarle, Jour. Farm Econ., Proceedings Number, February 1939, pp. 356-364 and Results of four methods of sampling individual farms, by Irvin Holmes, in the same issue, pp. 365-374.

increasing interest of students in small and part-time farm units and to a greater concern with the social aspects of agriculture. When the principal concern was with acreage and production the inclusion or exclusion of even a considerable number of small units was not a matter of great concern since the error introduced into totals for acreage and production was not large. Average acreages and production per farm were, of course, affected if such discrepancies in farm numbers were considerable. Question can well be raised, however, as to the importance of data on average anything per farm over the entire country or even for a single state.

This issue was brought sharply to the fore in a paper by Professor I. G. Davis in the *Journal of the American Statistical Association* for September 1933. Space will not permit a review or summarization of this article here. Davis's main conclusion was that the 1930 Census had failed to include considerable numbers of farm which had been included in 1925 and which actually were still in existence. He stated that "The primary cause of this is the unstandardized and subjective interpretation on the part of enumerators of the definition of a farm and the instructions relating to the cases in which farm records should be obtained."¹⁸

There was much discussion of this problem in the period just prior to the Census of 1935, and the Bureau of the Census made a special effort to assure completeness of coverage in that enumeration. That it achieved this in considerable degree is indicated in a comment by Professor J. D. Black and Dr. R. H. Allen that "as compared with the 1930 Census count, that of 1935 was unusually complete. It was the most complete count ever made with the possible exception of that of 1900. The 1930 count was the least thorough of any since 1890. The omissions in 1930 were mostly part-time farms in the size groups under 50 acres."¹⁹ A similar

¹⁸ Davis, I. G. A discussion of the accuracy of agricultural census enumeration in the Northeast. *Jour. Amer. Stat. Assoc.*, pp. 272-285. September 1933.

¹⁹ Black, John D. and R. H. Allen. The counting of farms in the United States. *Jour. Amer. Stat. Assoc.* pp. 439-470. September, 1937.

Through lack of space the author has not undertaken any extended discussion of the controversy with respect to the adequacy of coverage. The above article gives the findings of the two writers listed, and is followed by a discussion by this writer which points out some of the difficulties of attaining precision with respect to these small farm units. The problems with respect to farm definition are more fully treated in a following section.

conclusion by Mr. Joseph A. Becker has already been cited. Professor Black had criticized sharply the 1930 enumeration on the ground of inadequate coverage.

The principal steps taken to overcome this difficulty in 1935 were two; namely, strong pressure on supervisors and enumerators to assure inclusion of all farms, and arrangements whereby enumerators would not be expected to decide the matter of inclusion or exclusion of borderline units. The enumerators were instructed to take a schedule for every unit which might qualify as a farm, carrying down to somewhat below the probable limit of inclusion. These schedules were then classified in the Census Bureau. This procedure assures the use of comparatively uniform criteria in determining the status of borderline schedules. A further step is being taken in planning the 1940 Census, namely the preparation, on a far larger scale than in any previous census, of maps showing the locations of farms. This mapping has been made possible through the greater availability of air-photos of considerable areas and through extensive cooperation by state highway divisions. Good maps will be available in 1940 for some 2,300 of the approximately 3,090 agricultural counties of the United States, and less adequate maps for some 300 additional counties.²⁰

The Problem of Farm Definition.—The matter of farm definition has long been a subject of controversy among social scientists. Two conclusions would seem warranted in this connection; one, while there has been widespread disagreement with the census definition, there has been little crystallized agreement as to a desirable alternative; secondly, no very specific proposals for a substitute definition have been put forward. A possible exception to these conclusions may be noted in the defining of plantations and cropper units in the South. Here the judgment of social scientists appears to be fairly unanimous that listing croppers as though they operated independent farm units is unrealistic and a handicap to adequate analysis of the social problems of southern agriculture. In an article in *Social Research* for February 1938 Dr. Karl Brandt presents a vigorous condemnation of

²⁰ The preparation of the original maps involves exceedingly heavy expenditure and has only been possible through extensive cooperation and heavy inputs of funds by many of the state highway divisions.

the existing practice in this connection.²¹ His sweeping comments appear to take in too much territory and are possibly an intentional overstatement of the case. They would better have been applied specifically to the cropper and plantation problem where they would find quite general agreement among social scientists. Even in the South, however, where the plantation and the cropper unit bulk large in the agricultural economy there are all degrees in the tenant-owner relationship, and the problem of definition and classification is not an easy one.²²

The census definition for a farm, like most statistical definitions, must be arbitrary. The problem is that of finding a characterization that is practically workable and at the same time does as little violence to realities as possible. A committee of New England social scientists developed during the past year tentative proposals for a farm classification based on inputs of man work.²³ This has not so far reached a stage of being definitely proposed, and, while apparently it would give a much better picture of the situation, it seems likely that the problems presented in enumeration and tabulation may be insurmountable.

Methods of Handling Field Work.—The methods used in the field work of the various enumerations have also come in for a good deal of discussion, particularly during the present decade. Here as in the matter of farm definition, proposals for improvement have been scattered and lacking in definiteness and unanimity of opinion. The general plan used is substantially that which in 1880 replaced the old system of having the United States marshals take the census. That it has been subject to more political influence than is desirable most students would agree. That a workable substitute has so far been put forward would find less agreement. Proposals made include larger use of examination and training in the preparation of supervisors and enumerators, and more use of such people as the Department of Agriculture crop reporters and state statisticians. Various changes in field pro-

²¹ Brandt, Karl. Fallacious census terminology and its consequences in agriculture. Social Research, pp. 19-36. New York, February, 1938.

²² Study is being given to this problem in the plans for the 1940 enumeration and tabulation.

²³ From unpublished manuscript supplied by the New England Committee.

cedure have also been advocated.²⁴ Enumerations are usually handicapped by the lateness of Congressional action providing for them. This difficulty appears in almost every census taken up to the present time. A very serious problem arises from the need to develop in a few weeks a field staff of more than 100,000 people all employed on a temporary basis. It is doubtful if there are available, at least at existing rates of compensation, enough qualified enumerators to take a census with the degree of refinement now desired by many of those interested in census data. There is a tendency, however, to increase markedly the efforts to select a better enumerating personnel and to provide more adequate training.

Construction of Schedules Presents Many Difficulties.—The make-up of the schedule for the census of agriculture has been a perplexing problem especially in recent enumerations. Many agencies and individuals desire the inclusion of given questions designed to provide data of particular interest to them. The number of inquiries which it is practical to include is necessarily limited. Nearly all statisticians agree that even the 233 inquiries used in the 1930 general schedule constitute far too large a number for good statistical results. Yet, in preparing for the Census of 1940, the committee of the Department of Agriculture was confronted with requests for more than 600 inquiries arising from that department alone. Other agencies, some federal, some state, and some private, were urging the inclusion of many more. Many of these are meritorious inquiries, but simply too numerous to be handled within the limitations of census capacity. Others deal with problems which could be handled better and more economically by sample surveys made by technical people in the agencies desiring them, but such expense would have to be borne by the agency desiring the information, whereas if it can be pushed onto the census, even though the eventual cost of a complete enumeration may be much greater, the budget of the initiating agency will have been relieved. Other

²⁴ A number of these problems are discussed at some length in *The Census of Agriculture*, Bul. 40 of the Social Science Research Council, New York, 1937, which is a report by a joint committee of the Social Science Research Council and the American Farm Economic Association. This committee studied the problem of agricultural census improvement from time to time over a period of four years, from 1932 to 1936. Several of the other publications and discussions cited grew out of studies initiated or carried out by members of this committee.

inquiries seek material for propaganda purposes and may have heavy, sometimes unscrupulous, political pressure back of them. Some machinery must therefore be established to handle the thankless task of sifting, eliminating, and reformulating this mass of proposed inquiries.

Techniques have been developed for limiting, in some degree at least, the numbers of inquiries. Final decision about this rests with the Director of the Census. If at times he has seemed to rule with an iron hand in this connection it must be admitted that circumstances have forced him to eliminate somewhat ruthlessly. In recent years a beginning has been made by staff and advisors on an attempt to establish more objective criteria for deciding upon inclusion or exclusion of given questions.²⁵ In the meantime the Director might well post as a horrible example the schedules of questions listed for the Census of 1880.

For the enumerations of 1920, 1925, 1930, and 1935 the Department of Agriculture was invited to set up a committee to advise with the census officials in this connection. This committee did not so much function as a separate entity as in the form of an addition to the Census Bureau's own schedule committee.

In the report of the joint committee previously referred to, suggestion was made for a somewhat more definite organization for advising in this connection and a number of features of these proposals have appeared in the arrangements for 1940.²⁶ In the first place the Department of Agriculture was asked to provide through its own committee for more adequate hearing on the inquiries desired by its subdivisions, and also was asked to sift these down to a number in keeping with the maximum designated by the Director of the Census. This procedure resulted in shifting from the shoulders of the Census schedule committee much of the work and onus of making this vast reduction in inquiries to be considered.

Secondly an agricultural census advisory committee was set up which included members both from the Department of Agriculture and from nongovernmental agencies as well.²⁷

²⁵ See, for example, Social Sci. Res. Council Bul. 40, *The census of agriculture*, pp. 19-30 (New York, 1937).

²⁶ Social Sci. Res. Council Bul. 40. *Op. cit.*, pp. 14-19.

²⁷ Officially the committee consisted of Dr. S. H. DeVault, University of Maryland; W. F. Callendar, United States Department of Agriculture; Fred Brenckman,

Many sessions of this committee were held and serious effort was put forth with a view to weighing the relative merits of various proposed inquiries both in the light of census experience and in terms of the needs and desires of users. The work was facilitated by the experience resulting from the trial census schedules used for the first time in 1938. These were filled in through a cooperative arrangement between the Bureau of the Census and the Division of Crop and Livestock Estimates of the Department of Agriculture, field men of the latter agency acting as enumerators. Thus it was possible to get a better understanding of the results which might be expected from the use of given inquiries both as to content and form.

While the mechanism established appears cumbersome, it seems evident that the interests desiring to propose inquiries for inclusion in the schedule had opportunity for the fullest and most orderly consideration of their propositions that has been afforded in any census to date. In the opinion of many competent persons the resulting schedule is one of the best so far produced, though it is far from satisfying all of the desires of all of the groups or possibly of any of them.²⁸

The schedule for 1940 marks a significant departure in its use for the first time of a regionalized section on the main schedule. This departure was strongly advocated in 1935 but failed of adoption. It is a substitute for the special area schedules used in 1930 which presented considerable difficulties in editing and tabulation.²⁹ Such regionalization makes possible the inclusion of more crops in any given region without increasing the size and complexity of the schedule as a whole.

A growing problem in schedule making has been presented by the ever-increasing demand for questions on economic and social aspects of agriculture as contrasted with those for

National Grange; Harold F. E. Jeunet, Agricultural Publishers Association; H. G. Keeney, Farmers' Educational and Cooperative Union; W. R. Ogg, American Farm Bureau Federation; and Dr. Ole Negaard, Central Statistical Board. Actually, of course, various specialists of the Census Bureau participated in the discussions, and numerous individuals representing various viewpoints or agencies appeared before the committee.

²⁸ Unofficial census committees have developed from time to time particularly in areas where special problems of enumeration exist. Probably the most active of these were the one in California prior to the Census of 1930 and the one in New England during the decade 1930 to 1940.

²⁹ The supplemental fruit and nut schedules of 1930 introduced in a somewhat different way a certain amount of regionalization.

merely physical data. The latter, of course, encounter much less resistance from farmers. Specific provision has never been made in the census acts for data of this kind, except those on mortgage debt and value of farms and improvements. Since the acts providing for the enumerations of 1900, 1910, and 1920 did specify the types of data to be included, their provisions are to some extent carried over by implication. They provided for little in the way of social and economic data. Such of the inquiries of this nature as are included are therefore of a somewhat extra-legal character and have been so included only in response to very urgent pressures for them.³⁰ Their number is necessarily somewhat limited since the Bureau is rather specifically, at least by presumption, required to cover the items of physical production, and this requirement forces absorption of a considerable portion of the limited schedule space. The ever-present problem of balancing the merits of continuity against those of change must also be taken into account in the efforts to meet the needs presented by an ever-changing national economy.³¹

Thus through a century of effort, study, and controversy a huge organization for gathering basic agricultural data has grown up. It has laid its foundations in terms of an exclusive realm, not of subject matter but of method; namely the method of enumeration. It has adhered rigorously to this method, some think too rigorously. Be that as it may, the census performs that function in the collection of agricultural statistics which is most difficult and most expensive for other agencies to perform for themselves. Far-reaching changes are occurring in the sources of agricultural data, in the uses to which they are put, and in the interests which they serve. There is need for continuous study, modification, coordination, and improvement with respect to the data and the methods used in their collection. It is to be hoped that, as an aid to further progress, the Census Bureau will take occasion in the forthcoming centennial census of agriculture to bring out a much more complete and detailed history of the agricultural census than it is possible to present in the space of this paper.

³⁰ T. Lynn Smith, *Jour. Farm Econ.*, pp. 679-687, August, 1938; G. M. Peterson, *University of California Agr. Exp. Sta. Bul.* 630, Berkeley, 1939.

³¹ Vergil D. Reed, *Jour. Amer. Stat. Assoc.*, pp. 625-635, December, 1937.

PROGRESS OF AGRICULTURAL STATISTICS IN THE WORLD

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Antiquity

AGRICULTURAL censuses are first mentioned in the oldest monuments of written history. In the early days, the principal forms of wealth were agricultural—landed estates, with their crops, serfs, and livestock. Consequently, when rulers of the highly centralized states of antiquity needed information on the wealth and income of their subjects, they turned to surveys of agricultural resources.

Records survive of a cadastral survey of Babylon in the third millennium B.C. The first census of population, taken in China under the Emperor Yao, in the XXIII century B.C., likewise, included an inquiry on the products of the soil. References to the wealth of different tribes in the Bible remind us of agricultural enumerations of the Hebrews.¹

Little is known of the agricultural statistics of the old Greece, but solonian reform and the redistributions of land frequent in Greek Republics could not have been carried out without cadastral surveys. The Persian King Darius was apparently following a well established routine when he ordered that a cadaster be taken in the conquered Greek colonies in Asia Minor, in order to make each citizen pay a share of the military tribute proportionate to the value of his landed estate.

The Romans made extensive use of agricultural statistics. The *Tabulae Census* taken in 555 B.C. by Servius Tullius contained an inquiry on the number of serfs in the possession of each citizen which was to show the value of his landed property. In the opinion of the historian—Titus Livy, this census was “of the greatest service to the Empire which was likely to arrive at such a pitch of grandeur, because by means of it charges of peace and war were levied accordingly to the value of estates of individuals and no longer born equally by all.”²

¹ de Jonnès, Moreau, *La statistique des peuples de l'antiquité*. Paris, 1851.

² Livy, Titus, *History*, London, 1814, 1: 63 (Book I).

A large scale cadaster was projected under Julius Caesar and carried out after his death. Censuses of population and their incomes which were taken by Roman proconsuls in the first centuries of our era all over the civilized world, were mainly surveys of landed properties and their output.

In Japan, censuses of population, their occupations and landed estates were taken in the first century B.C. under Emperor Soujin. In the seventh century of our era a detailed cadaster was conducted, and a check of all its data every six years was made obligatory. The supervision over the income of the population was such that all the subjects of the Emperor were asked to keep books of their earnings and expenditures and to present them periodically to the administration.³

Middle Ages

In the dark centuries which followed the fall of the Roman Empire, the progress of statistics was interrupted, yet the statistical routine of Antiquity was not altogether forgotten. Wars and the building of empires, which constituted the history of the Middle Ages, required information on agricultural conditions: Rapacious conquerors needed to know the size of their booty which consisted mainly of lands; thoughtful princes wanted to know the resources of their vassals whose might was vested first of all in landed property, serfs, and herds of cattle. Thus, censuses of landed estates have been left to us by the Middle Ages as milestones of conquests and state reforms.

In the eighth century the French King Charlemagne sent into the different parts of his vast kingdom officials instructed to describe the agricultural area and livestock, and to ascertain the value of crops and the income of landlords and villains. This is the origin of the "Polyptiques" which are regarded as the foundation of the French statistics. Some of them contained a very detailed description of huge feudal estates (utilization of land, crops, livestock, serfs, prices of commodities exchanged, consumption by families).⁴

³ Janagisawa, *Histoire critique des travaux statistiques au Japon depuis l'antiquité jusqu'à la restauration impériale*, Bul. de l'Inst. Internat. de Stat., 19: 245-307. 1911.

⁴ The famous Polyptique of Abbé Irminon (published in Paris, 1844) covering the territory of St-Germain-des-Près is the best specimen of those surveys.

The most remarkable piece of statistics in Medieval England is the Domesday Book which contains returns of a nation-wide agricultural survey taken by William the Conqueror in 1086. After the victory over King Edward which gave the Norman conqueror control over the country, most of the old landlords were to be shaken off and replaced by new chieftains. Consolidating his conquest, the King sent all over the country commissions consisting half of Normans and half of English. These commissions took a questionnaire to be answered by each landowner under oath:⁵

- "1) What is the name of the mansion?
- "2) Who held it in the time of King Edward?
- "3) Who now holds it?
- "4) How many hides?⁶
- "5) How many teams—in demeasne—of the tenants?
- "6) What villains? What cottagers? What bondsmen?
- "7) What freemen and what sokemen?
- "8) What woods? What meadows? What pastures?
- "9) What is added or taken away?
- "10) What the whole was worth together, and what now?
- "11) How much each freeman or sokeman had or has?
- "12) All this to be given in triplicate: that is, in the time of King Edward, when King William gave it, and how it is now. And if more can be had for it than has been had."

The returns of this census were of such importance for the English Kings that the Domesday Book became one of the most venerated treasures of the Crown, and together with the Royal Seal accompanied the court on all travels of the sovereign. Sir Henry Ellis points out that the "Domesday Book presents but an imperfect view of the total population of England in 1086. For the owners and occupiers of land, and for the agricultural population, it may probably be considered as a fair record."⁷ The completeness of the census is witnessed by the bitter complaints of the Anglo-Saxon Chronicle:⁸

"So very narrowly did he [King William] let them speir it out

⁵ *Inquisitio Cantabrigiensis, subjicitur Inquisitio Eliensis*. (London, 1876) p. 97. See translation by Adolphus Ballard, *The domesday inquest* (London, 1906), p. 8.

⁶ A hide was about 120 acres tilled by a team of eight oxen.

⁷ Ellis, Henry, *A general introduction to domesday book*, printed by command of His Majesty King William IV (London, 1833).

⁸ *Saxon Chronicle*, 1: 14 (Latin; see translation by A. Ballard).

that there was not a hide nor a yardland, nor—it is shameful to tell though he thought it no shame to do—so much as an ox or a cow or a swine was left, that was not set down in his writ; and all these writs were brought to him afterwards.”

To be sure, the tax of six shillings levied upon every hide to defray the expenses of enumeration did not contribute to its popularity.

Complaints similar to those of the Chronicle resound in the writings of Russian chroniclers of the thirteenth century. The Russian plains, with their weakly organized princedoms, had been conquered by the Mongolian hordes. For the purpose of collecting the tribute, the new masters following the old usage, sent their emissaries with troops to make a survey of all farms and urban dwellings. According to the chronicler, this was a census on horseback: “They rode all around, the Cains, and counted everything they saw.” Four censuses were taken by Mongolians during the 240 years of their domination over Russia, and this left a deep impression in the soul of the people. For centuries to come there remained a feeling that a census was an act of godlessness, and a forerunner of troubles and calamities.

In Hungary after this kingdom had been overrun by the Turks, a cadastral survey was carried out for a purpose similar to that of the Persian census in Asia Minor, the Mongolian enumeration in Russia, or the inclusive agricultural survey made by the Arabs in Spain immediately after her subjugation.

New Times

The general trend in the agricultural statistics of more recent times is the tendency to approach the agricultural problems from the angle of national economy and the needs of the rural population, rather than that of military or fiscal requirements. Returns of enumerations are no longer considered as State secrets or private information of the ruler but are made public. It is more and more recognized that agricultural statistics should help farmers and protect consumers from abuses. Another trend in these statistics is that the scope of inquiries has been extended, new problems have been included into enumerations, censuses are now taken in shorter intervals, new devices are used for obtaining current

information on crops and prices to be expected in the near future.

The writers do not intend to give here an inclusive account of the progress of agricultural statistics in all countries. Only the most salient features of the development of international agricultural statistics, and of the history of statistics in France, Great Britain, Russia and Germany will be pointed out in the following pages.

France

France led in the development of statistics up to the second half of the 19th century. She was the first to publish statistical returns, first to create a special administration for the collection of statistics (*Statistique Générale*), first to promote the idea of international statistical cooperation. In the field of agricultural statistics France has the credit of the first estimates of agricultural output, the first surveys on sale and consumption of grains and meat, and the first large scale cadaster ever taken. Besides this, the history of agricultural statistics in France is remarkable for the glamour of great names who contributed to their progress.

Already in the Middle Ages, the French Kings were concerned over sudden changes in meat and grain prices. In an effort to stabilize the market they ordered that, information be collected on crops, receipts of livestock, and grain stocks in Paris. In 1304 the price of grain in Paris having been extraordinarily high, Philippe the Fair ordered the Municipal Council to have a census made of all the grains harvested in the province of Ile de France. At the end of the 14th and beginning of the 15th century, detailed statistics on meat sales in Paris were gathered, and the number of heads of cattle delivered each week was made public. After 1438 grain merchants and bakers were called upon to report every Saturday in the presence of the clerks of the Municipal Council of Paris the price of grain and the places where it was believed to be. This ordinance was reenacted in 1471, 1546 and 1577.⁹ This measure was applied only to the province of Paris, yet Paris being the most important division of the kingdom the policy pursued in its markets influenced all the other cities.

⁹ Faure, Fernand, *The development and progress of statistics in France in The History of Statistics*, edited by John Koren, p. 230. New York, 1918.

An ordinance passed in 1539, during the reign of François I, provided that municipal authorities of each seneshal town draw a weekly statement of stocks of grain, wine, and hay. Under Charles IX, in 1572, semiannual statements on the conditions of the crops were made obligatory.¹⁰

In 1698, under Louis XIV, the regional superintendents were charged with collection of statistics in their provinces, and in others on crop production and livestock. Their *Mémoires* (reports to the king) had been made no more public than any other state paper, but they circulated in handwritten copies all over the country.

At the beginning of the 18th century an attempt was made to estimate the total agricultural output of the French Kingdom. The initiative belonged to Maréchal Vauban, the military genius and one of the most outstanding statesmen in the brilliant reign of Louis XIV. The old Maréchal felt that the weakest point of kingdom was in its financial organization. Not only was there an excessive burden of taxes on the lower classes of the population, but the system of collection through private concessionaries resulted in intolerable abuses and hardships, without providing the government with sufficient means. Vauban dreamed of a financial system based essentially on a uniform excise tax on the output of agriculture, with an auxiliary tax on other incomes. The detested tax on salt could in his opinion be cut to one-half; the population no longer needed to be exploited by tax collectors, and yet the king would get money enough for all his needs if all the products of the soil were taxed at five per cent of their price, in the same way as they were actually taxed at ten per cent by the Church (the so-called *Dixme Ecclesiastique*). Advocating this plan in a pamphlet published anonymously in 1707, Vauban pleaded the cause of the underprivileged majority who to him were the backbone of the military and economic strength of France.

In order to prove that the yield of the suggested tax would be sufficient, Vauban presented an estimate of the agricultural output of the kingdom.¹¹ He showed that France had a

¹⁰ Levasseur, Emile, *Note sur l'organisation du service des subsistances et la publication des Mercurials*, p. 192. Paris, 1886.

¹¹ Vauban, Monsieur le Maréchal, *Projet d'une Dixme Royale*. Paris, 1707. Reprinted from the anonymous pamphlet.

surface of 30,000 square leagues, each square league capable of nourishing from 700 to 800 persons. As the actual population was 627.5 person per square league, there remained a comfortable margin for the growth of the population and for taxation. The estimate of the agricultural output was based on an analysis of agricultural conditions in a typical province (Normandy), and on a check sample investigation in a selected square league. Vauban found that the average output of a square league was 56,000 livres, and that a royal tax equal to one half of the *Dixme Ecclesiastique* would cover the greatest part of State expenditures.

In the same pamphlet, confiscated and suppressed by the personal order of the King, Vauban proposed that annual enumerations of the population and agriculture be made. His schedule for enumeration of parishes, the smallest administrative units, is reproduced here in facsimile as the first schedule in the world in which a census of land and livestock was ingeniously combined with enumeration of inhabitants, their houses and enterprises such as grain mills and public houses.¹² (See Schedule, page 768.)

A century later, the great French naturalist, Lavoisier, generally regarded as the father of modern chemistry, was facing a problem similar to that which had hunted the imagination of Vauban. As a member of the Royal Agricultural Committee he began in 1784 to study the agricultural resources of France, with the purpose of establishing a balance of production and consumption. In his plan Lavoisier considered the whole kingdom as a single giant enterprise book- ing all receipts on one side of the balance, and all expenditures on the other. He thought to have on one side the whole crop production amounting to 14 billion pounds of grain while the other side included such items as seeds, remuneration of farmers and farm laborers, taxes, rents. He wanted

¹² In order to carry out annual enumerations of the population and its agricultural resources Vauban suggested a quasi-military organization of the whole nation. Each 50 households had to be supervised by a captain with two lieutenants whose task was to canvas quarterly each household and ascertain changes in its economic and family status, acting in case of internal quarrels as mediators. There was no salary for these services, but the privilege of being addressed as "Monsieur" by common citizens, with their hat off, and honor seats in the parochial church, as well as a moderate fee paid by each household: one chicken annually (one half going to the captain, the rest to his lieutenants).

this balance to be flexible, in accord with varying prices and yield, and capable of showing the taxability of the French agriculture under different business conditions. No less a mind than Lavoisier could wage a project so vast and ambitious at a time when there were actually no exact statistics available.

Lavoisier's personal experience as a successful farm operator¹⁵ associated with the strength of scientific intuition enabled him to draw a remarkably clear picture of agricultural production and consumption in the country. Because of lack of statistics on cultivated area, he based his calculations on the supposed number of plows in the nation, more exactly on the number of teams of horses and oxen used for plowing (counting 3 horses or 4.5 oxen per plow), and checked the obtained results with an estimate of consumption of different groups of the population. Lavoisier's work though shelved before completion came to the attention of the National Assembly in 1791. The Assembly needed data on land utilization and ownership, agricultural output, and income of farmers. As the government could not or would not supply the Assembly with pertinent material, an appeal was made to Lavoisier who then submitted to the Assembly his unfinished manuscript. The Assembly was so impressed by this daring estimate that it decided to publish the memorandum, and a milestone in the history of statistics was thus established: not only was this the first statistical publication of the French government, but it was also the first time that a government press printed an estimate, offered as the personal opinion of an expert.¹⁶

As a result of this discussion, the Assembly voted that a cadaster be carried out. However, an investigation of such scope could not be launched in the troubled years of the Revolution, and the cadaster was not started until the days of Napoleon who was a great admirer and promoter of statistics. Unfortunately this interest of the Emperor provoked a

¹⁵ Lavoisier possessed a farm of 1,200 acres and tried to operate it on a scientific basis. He established experimental plots, varied manuring and dates of seeding, with the result of having doubled the yield and increased by 400 per cent the livestock in his estate.

¹⁶ Lavoisier, Antoine Laurent, *Résultats extraits d'un ouvrage intitulé: De la Richesse Territoriale du Royaume de France*. Imprimé par ordre de l'Assemblée Nationale (Paris, 1791).

vehement reaction against any kind of statistics on the part of his foes. After his fall, all his statistical projects, including that of the cadaster, were discontinued, and even the *Statistique Générale* he had created was abolished. In 1833 this office was reestablished and the cadaster resumed. It was completed in 1845.¹⁷ Since that time France possessed a complete description of her cultivated area under each crop, her crop production by quantity and value, and consumption in each of her 37,000 communities.

The scientific and practical value of this information ought not to be measured with an American yardstick: a statistical investigation prolonged over forty years would be of little use in a country in a state of continuous transition, but is no drawback in a nation with a standard population and a rigid agricultural structure. The 100-year-old cadaster remains until now the foundation of the economic geography in France.

In 1836 an inclusive program of annual agricultural statistics (cultivated area and production of main crops), and decennial censuses (all branches of production and rural economy) was established. The scope of the annual surveys has been enlarged considerably, with time, and besides the crop production they include data on the total value of each crop for each of the 90 provinces of France, as well as statistics on fruits, vegetables, livestock, vintage, forestry, canning and preserving factories, and prices of all agricultural products.¹⁸

The returns of 1842 agricultural census were published in four volumes "*Agriculture of France*," containing data on output for each product, and livestock numbers. The 1852 census added information on land tenure, value of land, rent, implements and machinery, use of fertilizers. The first two censuses were disappointingly incorrect, and the Ministry of Agriculture actually acknowledged their failure, accounted for by inclusion into the schedule of questions too complex for the average farmer. Since then continuous efforts have been made to check the collected information (not without a typical French gesture: While in Russia false data were pun-

¹⁷ de Jonnès, Alexander Moreau, *Statistique de l'Agriculture de la France*, pp. 10-12. (Paris, 1843).

¹⁸ See, *Statistique Agricole Annuelle*, published yearly by the French Ministry of Agriculture.

ished by death and in Germany by heavy money penalties, in France decorations were promised for exact agricultural returns!). Detailed enumerations were carried out in 1862, 1882, 1892, and after an interruption of 37 years, again in 1929. The final report of this last census gives a remarkably detailed picture of agricultural conditions in France.¹⁹ The census data are presented under three main headings:

1. Area and production of various crops (cereals, sown grasses and other forage, food crops) including statistics on vineyards, flowers and fruits, nurseries, forests, and production of lumber;
2. Livestock including statistics of births and deaths for its principal kinds, production of milk, eggs, meat, wool;
3. Farm economics (size of the holdings, tenure; farm labor, wages, housing conditions; village handicraft; agricultural implements and motors; construction activities in rural areas; use of fertilizers; unions of farmers; credit, insurance; enterprises such as grain mills, beet sugar factories, canning and preserving factories).

The 1929 census is regarded as one of the most inclusive and reliable enumerations of agriculture ever taken by a great nation.

Great Britain

For many centuries the Domesday Book remained the only statistical description of England and its agricultural resources, until in the 17th century studies in agricultural statistics were initiated by private scholars. This method of progress in statistical research is traditional in England: Individuals do the pioneering work; the government follows along. In this way not only crop statistics but even censuses of population were introduced in England.

The outstanding names in economics and statistics of the 17th century England were William Petty and Gregory King. The latter was particularly interested in agricultural statistics. He prepared an estimate of various kinds of land which England possessed (arable land, meadows and pastures, forests, crop production and prices of crops). He also made an estimate of the livestock of the nation, (calculating

¹⁹ Ministère de l'Agriculture, Statistique agricole de la France. Résultats Généraux de l'Enquête de 1929. (Paris, 1936).

the whole stock, its yearly increase, and the value of each kind, and of the yearly consumption of meat.²⁰

In the middle of the 18th century Great Britain was on the verge of taking the first census, but the proposal met with a strong opposition in the House of Commons. The leader of the opposition on this subject, Mr. Thornton, City of York, was particularly eloquent:²¹

"I did not believe," said he, "that there was any set of men, or indeed any individual of the human species, so presumptuous and so abandoned as to make the proposal we have just heard. . . . I hold this project to be totally subversive of the last remains of English liberty."

Another opponent stated that he knew by letters from his town, and from other parts of the country, that "the people looked on the proposal as ominous, and feared lest some public misfortune or any epidemical distemper should follow the numbering." The census project was defeated. There remained however a real demand for statistical data, and a private scholar, Sir John Sinclair, carried out in 1791 a survey of the population, agriculture, trade and industry of Scotland, by inquiries sent to the clergy of the Established Church. The questionnaire he used differed from the modern schedule in that it required a description of local conditions rather than numerical statements. The questions related to agriculture were the following:²²

"State of property, number of proprietors and mode of cultivation.

Implements of husbandry; manures, seed time and harvest.

Remarkable instance of good and bad season.

Quantity and value of each species of crop.

Total value of the whole produce of the district.

Total real and valued rent.

Price of grain, total quantity of grain and the other articles consumed in the parish.

Number of horses, their nature and value.

Number of cattle, and ditto.

²⁰ King, Gregory, *Natural and political observations and conclusions upon the state and conditions of England*, 1696. Published for the first time by George Chalmers, as an appendix to his *Estimate of the Comparative Strength of Great Britain*, pp. 407-449 (London, 1802).

²¹ Census of England and Wales, 1901, General Report (London, 1904), p. A.

²² Sinclair, Sir John, *The statistical account of Scotland*, 1: 8-9. Edinburgh, 1791.

Number of sheep, and ditto.

Number of swine, and ditto."

Essentially the investigation of Sir Sinclair was a large scale census of population combined with a census of agriculture and a few questions on other industries and parochial finances. According to the spirit of that time, questions on the eminent men of the parish, character of the people, and means by which their situation could be improved were also included.

Of the total of 950 parochial priests over 900 answered the questions, some briefly, some in great detail, and their answers were published in condensed form in 21 volumes between 1791 and 1799, as a unique collection of statistical and economic information on population and life of each parish in Scotland. The diversity of information sought is as admirable as is the thoughtfulness of the answers. Sir Sinclair himself regarded his project as the first step toward an inclusive agricultural description of the whole kingdom. He dreamed of a time when such descriptions would be carried out periodically, each fifty or at least each hundred years. "It is to be hoped," he announced in the introduction to the third volume "that the example of Scotland will soon be initiated by other nations. For that purpose a specimen of the work has been translated into French, and transmitted to every person of power, political influence, or literary merit, on the continent of Europe."

The most remarkable feature of the project was certainly the idea Sir Sinclair had of statistics: "Many inquiries have been made into the political circumstances of nations," wrote he in his "Address to the Reader." "Unfortunately, however, they have uniformly been instituted with a view of ascertaining the state of the country, for the purposes of taxation and of war, and not of national improvement. . . . But in modern times . . . real statesmen and true patriots . . . are anxious to ascertain the real estate of agriculture (of a country), its manufactures, and its commerce . . . , the amount of the population . . . , the manner in which the territory of a country is possessed and cultivated, the nature and amount of the various productions of the soil, the value of the personal wealth or stock of the inhabitants." He finished his

address with expression of his faith in the most important of all sciences, political or statistical philosophy. "This is a science which in preference to every other ought to be held in reverence. No science can furnish, to any mind capable of receiving useful information, so much real entertainment; none can yield such important hints for the improvement of agriculture, for the extension of commercial industry, for regulating the conduct of individuals, or for extending the prosperity of the state; none can tend so much to promote the general happiness of the species."²³

The success of the enumeration accomplished by Sir Sinclair induced the Parliament in 1800 to establish a Census Office and to make the first census in 1801. In this census the agricultural population was counted separately from that engaged in all kinds of non-agricultural pursuits. The first occupational returns were however so inaccurate that the Census office could not tabulate them. Since 1811 the distinction between families engaged mainly in agriculture and those employed in other pursuits have become one of the basic classifications in the British censuses.

A half century later Sir John Bennet Lawes introduced crop estimates in England. In 1852 he made his famous estimates of production and consumption of wheat in England and Wales, Scotland, Ireland each separately, and in the United Kingdom collectively, and continued these surveys, from year to year, during more than three decades. His estimates were based on a very small, but scientifically controlled sample, namely of the weighted average yield per acre of five experimental plots in his estate in Rothamsted. Each of four plots was differently manured, one was not manured at all. After careful observation and comparison, for a series of years, of the fluctuations of results obtained in the experimental plots, and of those in the crop of the country generally, Lawes assumed that "the results of certain selected plots would afford a useful indication of the general character of the wheat crop in the country."²⁴ His chief difficulty was that at that time there was neither for England and Wales nor for

²³ *Ibid.*, 3: 12-16.

²⁴ Lawes, John Bennet, and Joseph Henry Gilbert, *On the home produce, imports, and consumption of wheat*. London, 1868.

the other parts of the Kingdom any official record or estimate of the area under wheat for any year. Thus he had to apply the meager data at his command for his estimates on wheat production and consumption. In the absence of better statistics, these estimates were generally accepted as fairly reliable, and were used by government agencies as well as private organizations.

In 1864, the House of Commons demanded the establishment of a national system of crop statistics, and the Board of Trade thereupon obliged every holder of agricultural land to report annually the acreage on crops and the number of livestock on his holding. First returns were collected in 1866. Since 1884 they have been supplemented by official estimates of the year's production of the principal crops, thus actually taking over the estimates of Sir Lawes. These new statistics are based on reports of crop reporters, each responsible for estimating the average yield of crops in every parish of his district.

A regular agricultural census first was taken in Great Britain in 1908, and then again in 1925.²⁵ In connection with this last census estimates were obtained on the average rent of holdings of various types.

Because of the declining relative importance of the British agriculture, that is, the predominance of imported goods in the consumption of the United Kingdom, British custom reports provide a clear picture of consumption in all kinds of agricultural commodities (food and raw materials) per head of population. These series covering several decades are unique in the international statistical literature, as evidence of prevailing trends and cyclical variations in consumption.

Russia

Up to 1870, agricultural statistics were collected in Russia almost exclusively for military and fiscal purposes. In feudal Russia enumerations of the population and landed estates were usual in spite of hostility of the people and the opposition of the clergy. Especially after the end of the 15th century acquisition of new provinces by Moscow was customarily followed by a census similar to that taken by William the

²⁵ The returns of the census 1913 could not be tabulated because of war.

Conqueror in England, and the Tsars of Moscow had a series of "Domesday Books" of their own, the so-called "Piszovy Knigi."²⁶

Peter the Great ordered, in 1718, a general census of population, to provide a basis for enrollment of soldiers.²⁷ The ordinance made it clear that the Czar meant business. Officials guilty of fraudulent understatements were to be hanged; census supervisors were authorized to jail and put in chains those governors who were delinquent with their reports. The panic stricken population fled in all directions, frequently leaving to the enumerators only deserted fields and abandoned villages. In 1721, an Ordinance of Mercy was issued, promising forgiveness to guilty officials, and entrusting the clergy with continuation of the census, under severe personal responsibility of priests and bishops.

If this census had been one of the least successful measures ever taken by Peter the Great, the next census, two decades later, was a complete failure. Instructions provided that the returns of each individual be checked with the returns of the preceding enumeration, and his whereabouts during the elapsed time be ascertained. Likewise each taxable person had to prove that he had paid all taxes during the past two decades, or pay the amount to enumerators acting also as tax collectors. No wonder many ran away from the census, hiding themselves all over the country, and very often beyond her borders. This census could not be completed and was stopped by an Ordinance of Catherine the Great ("In our motherly love and mercy to our subjects," announced the Empress, "we issue the order that the census be no longer taken").²⁸ Here is a school example of how a census can disorganize the entire life of a nation.

²⁶ Like the Domesday Book, the Russian Piszovy Knigi contained a brief description of individual holdings but did not tabulate the information by parishes or districts. For each holding they reported the number of serfs, the livestock, number of plows, arable land, stocks of grain, the number of hay ricks, the amount of yearly seeding, crop production. Later, in the 19th century, attempts were made to tabulate some of these statistics in order to obtain a clearer picture of economic conditions in Russia of the centuries ago. Incompleteness and inconsistency of returns made this task rather difficult. For a specimen of Piszovy Knigi see "Novgorodskija Pistsovyia Kniga," 1495, St. Petersburg, 1859.

²⁷ This and the following censuses up to the middle of the 19th century were called in Russia "revisions."

²⁸ Plandovskij, Wl., *Narodnaja Perepis*. St. Petersburg, 1898 (Russian).

Up to 1857, ten censuses were taken, but the results were unsatisfactory. Agricultural statistics, in the narrow sense of the term, began in Russia in the 1870's after the abolition of human bondage. Since it was no longer possible for the government to get information on rural population through serf owners, direct enumerations became necessary.

Landed property was enumerated in 1877 in a careful way, and again in 1887. In 1905, a new and more detailed enumeration was ordered in connection with agrarian riots, a feature of Russian political life since 1902. The riots themselves were carefully registered by the police, and these statistics together with those on economic conditions in the respective districts, belong to the most instructive data on political life in Russia at the beginning of the 20th century.

In 1876 and again in 1882, horse censuses were conducted at the request of the War Department. In 1882 there was a tabulation also of horses by their owners what actually amounted to a tabulation of peasants by number of horses in their possession—at that time one of the best characteristics of wealth of a farm.

Crop statistics had been collected, in Russia, up to 1880 by the police. In 1880, after the great famine, a new system of crop reports was introduced by the Interior Department: each district was represented by 12 reporters, six were landlords, and six were peasants. Two of the peasants were to be chosen from the well-to-do, two from those of moderate station, and two from the poor villagers. This quasi scientific stratification did not assure however reliable reports, as these were actually collected by the village administration utterly unprepared for statistical assignments. A similar method was applied, after 1904, to crop forecasting—with similar results.

The Department of Agriculture had a net of crop reporters of its own. It was found that their returns usually overstated the production as they actually were better farmers, while the reporters of the Department of Interior tended to understatements for fear of taxation. The range between the estimates was approximately 20 per cent.

The contributions of Russia to the progress of agricultural statistics have been the local investigations on farm economics and rural sociology, developed in the last quarter of the

19th century, and based on the sample method. They were carried out by "zemstvas," representative bodies charged with administering economic and cultural affairs of the rural population (maintenance of schools, building of roads, public health service, protection of forests against fire, agricultural education, support of handicraft). Some zemstvas headed by progressive landowners and intellectuals did their best in improving the economic and cultural conditions of peasants. Statistics were for them not only a basis for local taxation but also a means for attracting public attention to the evils of existing social conditions, as well as for awakening some activity among peasants themselves. The general characteristic of their statistics was the sociological approach to problems investigated.

Information was collected by canvassers from farm to farm and at village assemblies called for this purpose. Official schedules were supplemented by extensive descriptive material. To be sure, such investigations required a staff of highly qualified enumerators and could not be carried out in a short lapse of time. Usually an enumerator spent a full summer in field work in his district; enumerations which took three years were usual. Since it often happened that the program of enumerations was too ambitious in comparison with the financial means of the zemstvas, those studies were restricted to selected villages, and in some cases only every fifth or tenth farm was investigated. The Russian statisticians did not invent the sample method, yet they were the first to have applied it on a large scale to problems of farm economics.²⁹

The first general census of population in Russia, in 1897, did not pay any particular attention to agriculture. In 1916, an agricultural census was taken, mainly with the purpose of obtaining information on crop production, and livestock. More than 15 million farms had been covered but the tabulation of the returns was interrupted by the revolution. In

²⁹ The statistics of zemstvas covered actually all problems of rural sociology and farm economics. Their bibliography contains thousands of titles of studies—to be sure not all of them of the same scientific value. There are studies on statistical methods of sampling, on geographic conditions, soil and climate, population, tenure, rents and mortgages, implements, rural housing, handicraft, crop production, social groups within the rural population, farm labor, marketing of agricultural products, prices, cooperatives, etc.

1917 a new enumeration was started in order to ascertain the necessary data for the redistribution of lands by the Provisional Government, but no returns have become available before the November upheaval. The censuses in 1919 and 1920 were unsuccessful because of the civil war raging all over the country. A regular census of horses was taken in 1924-1925, and a complete census of livestock was carried out on January 1, 1938.

The current agricultural statistics of the Soviets differ from statistics of other countries in that they are based on reports of state controlled units, and are considered as a system of accounting of the kolchozes to the central administration on the one hand, and as a cross-section of the progress of agricultural science on the other.³⁰

The agricultural yearbooks of the USSR form the most inclusive collection of agricultural statistics in the world. They contain data on machinery and implements, methods of land utilization and manuring, production and shipments for all crops. Procedures and techniques used in different parts of the country are particularly emphasized in these reports.

Unfortunately there is no means of checking the reliability of reported figures. The recent fate of high chiefs of the Soviet statistical administration condemned as saboteurs indicates under what pressure Russian statisticians are working, and makes it highly probable that reporting agencies when making entry in an elaborate questionnaire might take into consideration the kind of answers they are supposed to deliver.

Germany

Germany has greatly contributed to the development of the technique of agricultural statistics, especially of censuses of farms, crop forecasting, and enumeration of livestock.

Livestock enumerations, Germany's oldest agricultural statistics, were taken for the first time in some German states as early as in the 14th century; for example, in 1302 in Bavaria.

In 1571 Prince August of Saxony issued an ordinance under the title "How a principedom and a country can be secured

³⁰ See, Agriculture of the USSR. 1935. (Moskow), 1467 pp. [Russian.]

and furnished with grain and other commodities." The ordinance prescribed a combined census of population, and stocks of grain, in order to find out which districts were well provided with and which deficient in food, and how much grain had to be imported. False statements from owners of grain were to be punished with the confiscation of their stocks.

More or less regular agricultural statistics were introduced in Prussia, Bavaria, Saxony and some smaller German States in the 18th century. In Prussia, Frederick II ordered in 1747 that every two weeks, grain prices be ascertained and presented to him in a tabular form. He prescribed also to collect statistics on seeding, production and consumption of crops, potatoes, tobacco, hemp and hops. In Saxony a similar ordinance was issued in 1755.³¹

The first detailed survey of land and crop production in Bavaria was taken in 1809-1810. Its results having been considered unsatisfactory, the survey was repeated in 1812, and again taken in 1832-1833 and 1838-1839. Each time improvements in technique were introduced, and the scope was enlarged. However, what these surveys returned resembled more of an estimate based on sample information rather than statistics, since landowners did not know exactly the extension of their arable land and how it was utilized.³²

Most of the series of German agricultural statistics do not go farther back than 1871, the date when the German Reich was founded. Since this date agricultural statistics had to be collected by separate states according to common principles established largely by the federal council, and worked into uniform tables which have been then transmitted to the central office of the Reich and compiled by it for the Reich as a whole.³³ Annual crop production reports were established in the Reich in 1878, reports on utilization of arable land in 1893.

More detailed basic statistics are collected by periodic enumerations of two types: survey of cultivated areas by

³¹ Boeckh, Richard, *Die geschichtliche Entwicklung der amtlichen Statistik des Preussischen Staates*. Berlin, 1863.

³² v. Mayr, Georg, *Die Organisation der amtlichen Statistik*. München, 1876.

³³ Zahn, Friedrich, *Die Statistik in Deutschland*. Pp. 45-180. München and Berlin, 1911. See also Eugene Würzburger, *The history and development of official statistics in the German Empire*, in *The History of Statistics* by John Koren, pp. 333-362.

communities, and enumeration of farms (similar to American Censuses of Agriculture). Surveys of the first type were taken in 1878, 1883, 1893, 1900, 1913, 1925 and 1933. They show the distribution of farm land in each administrative district according to its utilization (crop land, gardens, pastures, vineyards, woodland).

Enumerations of farms, taken in 1882, 1895, 1907, 1925 and 1933, constitute the most important part of German agricultural statistics and furnish information on the total area of each farm, tenure conditions, farm labor (with distinction between family and hired labor), agricultural machinery and implements, utilization of land, the yield per acre, and livestock. Their characteristic, in comparison with the American Censuses of Agriculture, is that most of the computed data are cross-tabulated by size of farms (measured by the total area of arable and other lands). Another characteristic of these statistics is that they stress the technical problems more than the economic. Indeed, they bring detailed information on implements and machinery (especially motors) used by each group of farms in each district, but fail to report as minutely on the value of output, expenditure of farmers and other problems relative to farm economics. The balance of the German agriculture is established by semi-official estimates rather than by census reports.

Outstanding are the German livestock statistics based, since 1913, on annual enumerations. During the World War censuses of livestock were taken quarterly. In the recent years quarterly enumerations have been carried out for hogs only since their figures are subject to considerable fluctuations from month to month. It is believed that frequent enumerations contribute to price stabilization. The livestock statistics are supplemented by detailed and highly reliable statistics of slaughterhouses. On the other hand the reliability of the recently introduced current reports on production of milk, cheese and butter is challenged by experts.

Likewise there are doubts on the exactness of itemized returns on fruits and vegetables, which actually cover but a part of the production.

International Statistics on Agriculture

In the 18th century the possibility of international statis-

tics was conceived by Necker, Secretary of Finances under Louis XIV. His idea took the form of a depository for statistical information for all the governments: "It would be desirable," he explained, "if they should come some day to communicate without difficulty all the general observations of which they should not be too jealous."³⁴ This depository was to include agricultural statistics.

A century later international agricultural statistics became a reality. Their foundations were established by the International Statistical Institute, their development was reserved to the International Institute of Agriculture.

International Statistical Institute

At its first session, in Brussels, in 1853, the Institute decided on five groups of materials necessary for agricultural statistics: (1) on the geographic and climatic conditions of a country; (2) tenancy; (3) general economic conditions influencing agriculture; (4) specific conditions of the agriculture itself; (5) reports of producers. The Institute suggested that decennial agricultural censuses be taken in all countries as a part of general censuses of population, and established a minimum program for them. This program included reports on area under each crop, amount and value of the product, quantity of fertilizers used, conditions of farm labor, and livestock numbers.

At the next session, in Paris, in 1855, the Institute gave much thought to the question whether agricultural information should be collected through enumerators paid and instructed by their governments, or be supplied voluntarily by farm operators. We cannot resist the temptation to quote some arguments offered by a French statistician at that session against paid enumerators:³⁵

"If salaried enumerators are sent into rural areas, the great majority of farmers in France and abroad (as human nature is the same everywhere) will be eager not to let them learn the truth. Why is the government spending money for this affair? they will ask themselves. What are its intentions? Surely new taxes! Then they will use all the tricks—and they know plenty of them—to

³⁴ Necker, *L'Administration des finances de la France*, 3: 361. Paris.

³⁵ *Compte rendu de la deuxième session du Congrès International Statistique à Paris, en Septembre, 1855*, pp. 396-398. Paris, 1856.

mislead the enumerators. . . . If you start now with an agricultural census," the orator concluded emphatically, "you will sooner or later take censuses of manufactures and trade, and you will need a special department of statistics with more officials than in any other branch of the government."

The Institute was not intimidated by this prophecy and voted that paid enumerators be employed for agricultural censuses. Another motion recommended that cadastral surveys give more information on farm labor, wages, and duration of seasonal employment. It recommended also to all governments to take annual surveys of crop production and to carry out censuses of livestock at least once in every five years.

At its following sessions the Institute examined problems related to statistics of landed property and crop production. Sixteen years after its establishment, the Institute was ready for its first project in agricultural statistics: it charged the French *Statistique Générale* with collection and publication of international agricultural statistics.

The questionnaire prepared by the French included four topics: (1) Area cultivated and uncultivated; (2) Production of each crop; (3) Livestock; (4) Size of holdings, and implements used. Answers were obtained only from Holland, Norway, Denmark, Finland, Hungary, Roumania, and incomplete returns came from Germany, Sweden and Great Britain. The results of this investigation were but a few incomplete series of international statistics incorporated by the *Statistique Générale* into its biennial reports.³⁶

A more advanced program of agricultural statistics was discussed at the session of the Institute in St. Petersburg, in 1897. The session emphasized the importance of cadaster as the basis for agricultural statistics, and recommended to governments a procedure of crop production estimates. The Institute proposed that typical farms be selected in each county, and the utilization of their arable lands be exactly ascertained in June, before the harvest. The proportion of areas under each crop in these farms should be then applied to all arable lands in the county. The average yield per acre

³⁶ *Statistique Internationale de l'Agriculture*. Publiée par le Service de la *Statistique Générale de France*. Paris, 1876.

should be established from the reports of the typical farms, for each crop and each section of the county separately.

The two following sessions of the Institute, in Christiania, 1899, and Budapest, 1901, were remarkable for addresses on agricultural statistics presented by Emile Levasseur. In his second address the great French statistician gave a general characteristic of crop reports which may be of interest to American readers:³⁷

"Farmers have so much practical interest [in questions they have to report on] that they frequently will deviate from truth. Most of them do not like to report on their income. . . . Their prevailing tendency is to understate rather than overstate their yield. It may be assumed however that there are nations in which this tendency does not prevail. In the United States where each individual is apt to boast over his own and his country wealth, the reported crop production figures may be inflated."

In 1911, at the session in Haag, Umberto Ricci, at that time Director of the statistical research of the International Institute of Agriculture, presented a report on "*Statistique Internationale des états de culture*." And again in 1913, at its last session before the World War, the Institute attacked once more the problem of crop statistics when Umberto Ricci stressed the necessity of speedy and uniform reports from all countries.

In 1923, the Institute again heard a report from Ricci on statistics of agricultural production, in which he emphasized that agricultural statistics might become useless unless they were made available soon after they had been collected. Crop forecasts in the United States or Russia, in his opinion, immediately affected the prices all over the world. Retrospective surveys might be of great value for scholars, but farmers, merchants, railroad and line companies were more interested in estimates though rough but rapidly released than in accurate figures which would appear with great delay.³⁸

³⁷ Levasseur, Emile, *Rapport sur les procédés et les résultats de la statistique agricole dans les principaux Etats producteurs*. Publié par l'Académie de l'Agriculture de France.

³⁸ Ricci, Umberto, *Statistique internationale des superficies et productions agricoles*. Published by the Institute, and republished by Ricci under the title: *Les Bases Théoriques de la Statistique Agricole Internationale*. Rome, 1914.

International Institute of Agriculture

The spiritual father of the International Institute of Agriculture in Rome, was a California dry goods merchant and fruit farmer, David Lubin, one of the most colorful personalities in the history of statistics. Born in a poor Polish-Jewish family, Lubin was taken to the United States by his mother, there he grew up in extreme poverty, but found his way to commercial success comparatively early, in the dry goods business. When he tried fruit growing and wheat farming, he failed. Meditating on the causes of his difficulties on the land, Lubin came to the conclusion that his efforts had been rendered futile by the same evil which makes insecure the life of all farmers all over the world. Farming is gambling, with all the odds against the farmer who works without any knowledge of the conditions that will determine the price of his crop. Was there any means to check this evil which was prone to upset all business conditions in all countries? Lubin believed that stability in agricultural prices and security in business could be established if each farmer could obtain necessary information on crop production, grain stocks and prices of crops. Such information could be obtained, he decided further, only through an international institute collecting, publishing, disseminating agricultural statistics! Since the proposal of the obscure dry goods dealer did not find any response in his country, Lubin decided to try to sell his project to Europe. Without any official connections, or backing but possessing a strong will, enthusiastic faith, and a magnetic personality, Lubin tried unsuccessfully in London and Paris, then secured against all difficulties an audience with the Italian King and succeeded in interesting him in this project. The King offered a building to the future Institute, and a yearly subvention from Italy, and sent invitations to other countries for a conference at which the foundation of the Institute had to be decided upon. Lubin's dream became a reality.³⁹

The International Institute of Agriculture was founded in 1905, and its statutes were ratified in the same year by 45

³⁹ Hobson, Asher, *The International Institute of Agriculture*. University of California Publications in International Relations. Berkeley, 1931. See also, O. R. Agresti, *David Lubin, A study of practical idealism*. Boston, 1922.

governments. The United States joined it in 1906, not without a strong opposition in Congress.

The statistical work of the Institute began in 1910,—it was a rather modest beginning, since seven agricultural commodities only, were covered in the early reports. The organization of the Institute and the scope of its statistical research were extended gradually, and at present time it is supported by sixty nations, and its publications cover not less than forty commodities.

To be sure, the statistics of an International Institute cannot be better than the information it receives from individual states. Not all its members are able to supply it with required information, and that submitted is not always reliable. Because of its official character, the Institute cannot question the accuracy of the data received from a government and has to accept them at their face value and include them in its reports. For such a huge and essentially agricultural state as China there are no statistics at all, for India only fragmentary data are available. The world totals of crop production computed by the Institute are therefore of questionable accuracy. The livestock statistics are still less complete, and so the Institute did not even attempt in its recent reports to establish the totals for the world.

Most complete and reliable are the Institute's reports on international commerce in agricultural commodities which now cover transactions in 65 farm products such as cereals, fruits, oil seed, oils, fibres, livestock. This list becomes more inclusive with each year. Good, also, are the statistics of prices of agricultural commodities on the main international markets.

On the other hand, international statistics on stocks of cereals and other commodities, statistics which David Lubin dreamed of when launching his project, have been up to now completely unsatisfactory. Statistics on production of wool, milk, butter, cheese and lumber are fragmentary, those on production and commerce of fertilizers are improving from year to year but still incomplete. Only scarce international information is available on the forms of tenancy of agricultural land, size of holdings, budgets of farmers, farm wages.

We are as yet far from the world census on agriculture

that the Institute conceived and whose scheme was formulated by it in 1930, a census which was to have been taken simultaneously in all parts of the world with the same basic questions in all schedules and with uniform definitions of the fundamental concepts. But the Institute has contributed efficiently to uniformity in terms and methods of agricultural statistics, and especially of agricultural censuses in the chief countries of the world. Its Yearbook is not only an invaluable source of information but also a mighty means of propaganda for international cooperation—at least in the field of agricultural statistics, if not in the field of agricultural production.

AGRICULTURAL PRICE STATISTICS IN THE UNITED STATES AND ABROAD

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THERE is in the United States today a large collection of statistics relating to prices of farm products. These have been collected both by workers immediately interested in the field of farm prices and by other workers interested in the problem of the general price level and only incidentally, in farm prices.

In outlining the history of the accumulation of farm price statistics, it has been found advisable to distinguish between studies of farm prices at the farm and studies of farm prices at large wholesale markets. In the latter group, indexes of farm prices prepared as parts of studies of the general price level have been included, if they cover a long period of time.

Many of the early studies of prices were stimulated by violent or prolonged changes in the price level, while other early collections of prices were made by governmental agencies which had the responsibility of collecting statistics. In more recent times, the importance of price studies has been so fully recognized that various research organizations have undertaken historical studies of prices.

Prices Paid to Producers for Farm Products Long-Time Series

The Crop Reporting Board of the U. S. Department of Agriculture has collected December 1 farm prices of crops since 1866 and January 1 farm prices of livestock since 1867, for each state and for the United States as a whole. In 1911, Murray¹ published index numbers of ten of these farm prices, with the 43-year period 1866-1908 as 100.

As a result of the rise and fall in prices during and following the World War, the interest in the price problem increased. Most of the studies of farm prices during the early twenties extended back only a few years before the outbreak of the World War. These are discussed under the short-time series.

¹ Crop Reporter, United States Department of Agriculture, 13 (3): 21. March, 1911.

Late in the twenties, the importance of historical studies was recognized. Under the stimulus of Dr. O. C. Stine of the U. S. Department of Agriculture, Hale² and Peterson³ made pioneer studies of farm prices for Maryland and Virginia. These studies went back to 1851 for Maryland; and to 1801 for Virginia. Both studies presented monthly prices of farm products for districts as well as for the states. In both cases, yearly indexes of groups and of all farm products were prepared. The Maryland study also included market prices at Baltimore; and the Virginia study, retail prices of seeds. Comparisons were made with the general price level and farm wages. These studies set a high standard for the work that followed in other states.

Norton and Wilson⁴ compiled annual prices of several farm products for eight representative areas of Illinois from 1866 to 1929. Orr⁵ published monthly prices of eight farm products for South Dakota from 1890-91 to 1930. Merchant⁶ published monthly prices of several farm products for Maine from 1852 to 1932. Filley and Hauke⁷ of Nebraska presented monthly farm prices of eight products from 1895 to 1932, based on quotations for different areas. In these four studies, composite district and state index numbers were not calculated from the series collected.

Mortenson, Erdman, and Draxler⁸ published a study of farm prices in Wisconsin from 1841 to 1933. Monthly prices of several farm products and annual index numbers for 6 groups and a composite were presented. Ronk⁹ collected

² Hale, R. F., Prices paid producers for Maryland farm products, 1851-1927, Maryland Agr. Exp. Sta. Bul. No. 321, September, 1930.

³ Peterson, A. G., Historical study of prices received by producers of farm products in Virginia, 1801-1927. The Virginia Agr. Exp. Sta. and the Bur. of Agr. Econ. of the U. S. Dep. Agr. cooperating. Unnumbered and undated. Manuscript completed in December, 1928.

⁴ Norton, L. J., and B. B. Wilson, Prices of Illinois farm products from 1866 to 1929, Ill. Agr. Exp. Sta. Bul. 351, July, 1930.

⁵ Orr, J. L., Prices paid to producers of South Dakota farm products 1890-1930, So. Dak. Agr. Exp. Sta. Bul. 259, April, 1931.

⁶ Merchant, C. H., Prices of farm products in Maine, Maine Agr. Exp. Sta. Bul. 364, March, 1933.

⁷ Filley, H. C., and A. M. Hauke, Local prices of farm products in Nebraska, 1895-1932, Neb. Agr. Exp. Sta. Bul. 284, July, 1933.

⁸ Mortenson, W. P., H. H. Erdman, and J. H. Draxler, Wisconsin farm prices, 1841 to 1933, Wis. Agr. Exp. Sta. Res. Bul. 119, November, 1933.

⁹ Ronk, S. E., Prices of farm products in New York State, 1841 to 1935, Cornell Univ. Agr. Exp. Sta. Bul. 643, March, 1936. Ronk, S. E., Prices received by producers in New York State, 1841-1933, a thesis presented to the faculty of the Gradu-

monthly farm prices of 30 products for nine districts in New York state from 1841 to 1935, and combined these into district and state index numbers. He also presented prices paid by farmers for a comprehensive series of prices of feeds, seeds, farm tools, and nursery stocks.

Adams¹⁰ published a preliminary report of prices paid to farmers in Vermont from 1790 to 1871 for eight groups and for a composite. This study is unique in that he presented also an index of retail prices paid by farmers with four groups and seven sub-groups from 1800 to 1871; farm wages from 1780 to 1937; and freighting rates, by sled and wagon, between Boston, Massachusetts and Vermont from 1813 to 1843.

Short-Time Series

The United States has a series of prices paid to producers for individual farm products in each state for each month from pre-war to the present time. No other country has assembled so thorough a collection of producers' prices.

About 1907-08, Nat C. Murray of the Crop Reporting Board started the systematic collection of monthly prices paid to producers for farm products. November 1912, he presented monthly index numbers of farm prices for ten leading crops.¹¹ Index numbers of prices of meat animals were presented¹² in January 1916. June 1918, index numbers of prices of crops, live stock, live-stock products, and the three groups combined were presented for two years, 1917-18, for the United States, for each of thirty-nine states, and for a group of eight mountain states.¹³ Murray also presented index numbers of articles bought by farmers¹⁴ as early as 1914.

ate School of Cornell University in partial fulfilment of the requirements for the degree of Doctor of Philosophy, 1934. In addition to the 30 major products, he tabulated for a part of the period farm prices of 15 minor products, such as honey, turnips, etc.

¹⁰ Adams, T. M., Prices paid by farmers for goods and services and received by them for farm products, 1790-1871; Wages of farm labor, 1780-1937, Ver. Agr. Exp. Sta., Preliminary Mimeographed Report, February, 1939.

¹¹ Crop Reporter, United States Department of Agriculture, 14: (11): 84, November, 1912. The methods used in computing this weighted index number were presented in Monthly Crop Report, United States Department of Agriculture, 4, (8): 96, August, 1918.

¹² Monthly Crop Report, United States Department of Agriculture, 2 (1): 10, January 31, 1916.

¹³ Monthly Crop Report, United States Department of Agriculture, 4, (6): 63, June, 1918.

¹⁴ Farmers' Bulletin 645, United States Department of Agriculture, p. 18, December 31, 1914.

In 1918, Pearl¹⁵ made an index of farm prices of food products weighted according to their respective nutritive values.

As a result of the collapse in commodity prices in 1920, the Secretary of Agriculture, H. C. Wallace, requested Warren¹⁶ of Cornell University to present a report on the price situation. This report included a weighted monthly index of United States farm prices for 31 products from 1909 to 1921.

The Bureau of Agricultural Economics¹⁷ presented a weighted monthly index of six groups and of all farm products in August 1924. This index has been revised from time to time and is now the accepted index of United States farm prices. In 1928, Purves¹⁸ published index numbers of prices paid by farmers for commodities. This index has been revised and index numbers of prices paid by farmers for commodities and services are now available from 1910 to date.

The first continuous monthly index of prices paid to producers in a single state was prepared by Warren¹⁹ for New York State. The next state index number was published by Weaver²⁰ of Pennsylvania. In June 1923, Falconer²¹ of Ohio published index numbers of prices of individual products, but did not present a combined state index²² until August 1925. Early in 1924, Warren and Pearson²³ constructed monthly index numbers for representative states. Young²⁴ published an index of Vermont farm prices in 1924. During the late twenties and the thirties, the number of states with indexes of monthly farm prices from pre-war to date increased rapid-

¹⁵ Pearl, R., General index numbers of food prices on a nutritive value base, United States Food Administration, August 1918.

¹⁶ Warren, G. F., Prices of farm products in the United States, United States Dept. Agr. Bul. 999, August 26, 1921.

¹⁷ Crops and Markets, United States Department of Agriculture, 1: 235, Sup. 8, August 1924.

¹⁸ Purves, C. M., Index numbers of prices farmers pay for commodities purchased, United States Department of Agriculture, B. A. E., Mim. Rep., August, 1928.

¹⁹ Warren, G. F., Prices of farm products in New York, Cornell Univ. Agr. Exp. Sta. Bul. 416, January, 1923.

²⁰ Weaver, F. P., The prices of farm products in Pennsylvania, Pennsylvania Agr. Exp. Sta. Ext. Cir. 101, November, 1923.

²¹ Falconer, J. I., Prices of Ohio farm products, Ohio Agr. Exp. Sta. Bul. 365, June 1923.

²² Falconer, J. I., Index numbers of production, wages, and prices, Bimonthly Bul. Ohio Agr. Exp. Sta., pp. 102, 103, July-August 1925.

²³ Warren, G. F., and F. A. Pearson, Prices paid to farmers in the United States for all farm products, Farm Economics No. 15, pp. 139-144, June 1924.

²⁴ Young, H. P., Prices of farm products in Vermont, The Vermont Agr. Ext. Service, Cir. 33, June, 1924.

ly and now includes more than half the states. These have been useful in educational work because state index numbers have proved much more tangible to farmers than those for the United States or for large city markets.

Most of these index numbers are weighted by production or marketing and are based on pre-war as 100. The Minnesota index is an exception, with a post-war base.

Wholesale Prices of Farm Products in the United States

There are various studies of wholesale prices which are useful to students of farm prices. Some studies present tabulations of prices of numerous farm products at wholesale markets. Others include indexes of prices of farm products, and some of the studies of the general price level have included sub-groups of farm prices.

Chase, Secretary of the United States Treasury, included in his report of 1863 one of the first systematic summaries of monthly wholesale prices.²⁵ The report presented prices of about 90 staple commodities²⁶ at New York City from 1825 to 1863. Several of these were farm products. Many students have used this report as a source of early prices.

The so-called Aldrich Report was one of the first systematic attempts to construct index numbers of prices in the United States.²⁷ Dr. Roland P. Falkner in charge of the statistical work for the Aldrich Committee collected prices for 223 commodities for the 52-year period, 1840-1891. Index numbers for eight groups of commodities including foods were calculated, and the prices were regrouped also to form an index of agricultural products. The index numbers were based on January prices, and January 1860 was taken as 100. The food index included so many kinds of fish, salt, bread, crackers, and the like that the index was not representative of American produced foods. The agricultural index was an average of 15 commodities in which all commodities received

²⁵ Report of the secretary of the Treasury, 38th Congress, 1st Session, House of Representatives, Executive Document, December 10, 1863.

²⁶ The number and names of the commodities varied somewhat from year to year.

²⁷ Wholesale prices, wages, and transportation. Report by Mr. Aldrich, from the Committee on Finance, 52d Congress, Second Session, Senate Report No. 1394, pp. 30 and 107, March 3, 1893.

an equal weight. Except for the weighting and the omission of dairy products, the index was fairly representative.

This work was followed by Bradstreet's²⁸ index which included four groups of breadstuffs, livestock, fruits, and provisions.

In 1900, the U. S. Department of Labor published the results of an investigation of wholesale prices from 1890 to 1899 which continued the work of the Aldrich Report,²⁹ except that the index of agricultural products was not brought up to date. In 1902, the U. S. Department of Labor started a new series of index numbers,³⁰ with the period 1890-99 as the base. A farm product as well as a food group was included. Since that time, the index numbers have been revised, weighted, the base period changed, and the number of commodities expanded.

In 1901, Dun's Review³¹ published an index of prices back to 1860 which included breadstuffs, meats, and dairy and garden products.

In 1908, Mitchell³² published a study of prices for the period following the Civil War. Prices of farm products were compared with prices of other commodities, and index numbers of prices of grains, meat, and cotton were presented.

In 1921, Hurlin³³ presented a yearly index number of wholesale prices of foods from 1810 to 1920 as a part of a study of the long-time trend of prices.

Warren and Pearson³⁴ published a series of prices from 1797 to 1932, including monthly index numbers of farm and food products with variable weights. For the earlier years, the series were based largely on quotations at New York City and a few quotations at Boston and Philadelphia. For

²⁸ Five years of prices of 110 staple products, Bradstreet's, 23, (899): 594. 1895.

²⁹ Falkner, R. P., Wholesale prices: 1890 to 1899, United States Department of Labor, Bul. 27, March, 1900.

³⁰ Course of wholesale prices, 1890 to 1901, United States Department of Labor, Bul. 39, March, 1902.

³¹ Dun's Review, January 12, 1901.

³² Mitchell, W. C., Gold, prices, and wages under the greenback standard, Univ. Cal. Pub. in Econ. 1: 48-57, March, 27, 1908.

³³ Hurlin, R. G., The long time trend of prices in the United States, The Annalist, 17, (442): 708, July 4, 1921.

³⁴ Warren, G. F., and F. A. Pearson, and H. M. Stoker, Wholesale prices for 213 Years, 1720 to 1932, Cornell Univ. Agr. Exp. Sta. Memoir 142, November 1932.

the later years, the prices included several cities east of the Mississippi.

Studies of early wholesale prices in various coastal and river ports have been made. In 1923, Falconer³⁵ published annual wholesale prices at Cincinnati for 11 farm products and an unweighted index covering the 73-year period 1848-1920. In 1935, Berry³⁶ and White³⁷ also published studies of wholesale prices at Cincinnati. Berry covered the period from 1816 to 1860; and White, 1844 to 1914. Berry published a monthly index of wholesale prices of commodities identified with northern agriculture for three different periods, 1816-25, 1824-46, and 1846-60 each on a different base. White published monthly index numbers of farm and food products from 1844 to 1914.

Taylor³⁸ made a study of prices at New Orleans covering the period from 1800 to 1861 and published index numbers of eight, five, and four Louisiana products for three different periods with no common base.

Taylor³⁹ also made an analysis of prices at Charleston, South Carolina, from 1732 to 1791, in which he included an unweighted index of seven products that were probably representative of the agriculture of the area at that time.

Bezanson, Gray, and Hussey⁴⁰ published a study of colonial prices around Philadelphia, covering the period 1720 to 1775. The monthly prices of individual farm and food products were presented, but index numbers of these groups were not calculated. The same authors⁴¹ published a series

³⁵ Falconer, J. I., Prices of Ohio farm products, Ohio Agr. Exp. Sta. Bul. 365, pp. 140-1, June 1923.

³⁶ Berry, T. S., Wholesale commodity prices in the Ohio Valley, 1816-1860, The Review of Economic Statistics, Vol. 17, (5): 79-93, August, 1935. The index numbers are published in Cole, A. H., Wholesale commodity prices in the United States, 1700-1861, Appendix F, pp. 180-187, 1938.

³⁷ White, H. E., Wholesale prices at Cincinnati and New York, Cornell Univ. Agr. Exp. Sta. Memoir 182, October, 1935.

³⁸ Cole, A. H., Wholesale commodity prices in the United States, 1700-1861, pp. 170-177, 1938.

³⁹ Taylor, G. R., Wholesale commodity prices at Charleston, South Carolina, 1732-1791, Jour. Econ. and Bus. Hist., 4 (2): 356-377, February, 1932.

⁴⁰ Bezanson, A., R. D. Gray, and M. Hussey, Prices in Colonial Pennsylvania, Ind. Res. Dept., Wharton School of Finance and Commerce, Research Studies XXVI, 1935.

⁴¹ Bezanson, A., R. D. Gray, and M. Hussey, Wholesale prices in Philadelphia, 1784-1861, Ind. Res. Dept., Wharton School of Finance and Commerce, Research Studies XXIX, 1936.

of monthly prices at Philadelphia from 1784 to 1861, which included monthly index numbers of 26 agricultural commodities with several groupings that are of interest to the student of agricultural prices.

In 1932, Stoker⁴² presented an index number of 71 series for 52 different commodities at New York City from 1720 to 1800. Group indexes for agricultural products were not included.

In 1926, Cole⁴³ published a chart of monthly wholesale prices of 14 agricultural products at Boston, Philadelphia, and New York, from 1825 to 1845. This was followed in 1929 by a monthly index of wholesale prices of 10 agricultural products at Boston and New York⁴⁴ from 1843 to 1862. The first⁴⁵ index was calculated on an 1834-42 base; and the second,⁴⁵ 1848-58.

A part of the original series tabulated for the six cities—Cincinnati, New Orleans, Charleston, Philadelphia, New York, and Boston—was published under the auspices of the International Scientific Committee on Price History.⁴⁶ The report presented many monthly series of prices of farm products which, although incidental to the study of the general price level, are of especial interest to the student of agricultural prices.

Foreign Index Numbers

Ireland⁴⁷ has an annual index of prices paid to producers at fairs and markets, from 1840 to date. England⁴⁸ has a monthly index of farm prices on a pre-war base. Canada⁴⁹

⁴² Warren, G. F., and F. A. Pearson, and H. M. Stoker, Wholesale prices for 213 Years, 1720 to 1932, Cornell Univ. Agr. Exp. Sta. Memoir 142, November 1932. Some of the original prices were published in Cole, A. H., Wholesale commodity prices in the United States, 1700-1861, Statistical Supplement, 1938.

⁴³ Cole, A. H., Wholesale prices in the United States, 1825-1845, Rev. Econ. Stat., 8 (2): 69-84, April, 1926.

⁴⁴ Cole, A. H., Wholesale commodity prices in the United States, 1843-1862, Rev. Econ. Stat., 11 (1): 26-37, February, 1929.

⁴⁵ The two index numbers were published in Smith, W. B., and A. H. Cole, Fluctuations in American business, 1790-1860, Harvard Univ. Press Study, 50, 159, 168 (Appendix A), 1935.

⁴⁶ Cole, A. H., Wholesale commodity prices in the United States, 1700-1861, Vol. 1 and 2, 1938.

⁴⁷ Irish Trade Jour., 4 (2): 93, February, 1929.

⁴⁸ Agricultural Statistics, 1929, Ministry of Agriculture and Fisheries, 64 (2): 84, 1930.

⁴⁹ Monthly Bulletin of Agricultural Statistics, Dominion Bureau of Statistics, 22 (246): 51-52, February, 1929.

has index numbers of farm prices for each of the nine provinces as well as for Canada as a whole since 1909. In a study of the effect of famines on prices in China, Buck⁵⁰ constructed an index of interior prices of 9 agricultural products, in copper currency, from 1875 to 1923. Chang⁵¹ published a study of prices and indexes of prices paid to and by farmers in China. The monthly prices paid to farmers extend back to 1894.

There are several historical collections of prices of many farm products for foreign countries. Those of Rogers,⁵² Tooke,⁵³ d'Avenel,⁵⁴ and Van Houtte⁵⁵ are among the better known. Recent outstanding contributions were made by Hauser,⁵⁶ Elsas,⁵⁷ Jacobs and Richter,⁵⁸ Pribram,⁵⁹ Beveridge,⁶⁰ Bujak,⁶¹ and Hamilton⁶² under the general auspices of the International Scientific Committee on Price History.

In general, these studies are valuable source materials, but index numbers of farm prices were not presented in most instances. The works of Rogers,⁵² Tooke,⁵³ and Beveridge⁶⁰ were investigations of prices in England; d'Avenel⁵⁴ and Hauser⁵⁶ in France; Van Houtte,⁵⁵ in Belgium; Jacobs, Richter,⁵⁸ and Elsas,⁵⁷ in Germany; Bujak,⁶¹ in Poland; Pribram,⁵⁹ in Austria; and Hamilton,⁶² in Spain.

Some indexes of prices of agricultural products, of farm

⁵⁰ Buck, J. L., Price changes in China, *Jour. American Stat. Assoc.*, 20 N. S. (149): 239, June, 1925.

⁵¹ Chang, L. L., Farm prices in Wuchin Kiangsu, China, Bureau of Foreign Trade, Ministry of Industry, Booklet Series No. 19, June, 1932.

⁵² Rogers, J. E. T., A history of agriculture and prices in England, 1866.

⁵³ Tooke, T., and W. Newmarch, A history of prices and of the state of the circulation from 1792 to 1856.

⁵⁴ d'Avenel, G., *Histoire Économique de la Propriété, des Salaires*, 1894.

⁵⁵ Van Houtte, H., *Documents Pour Servir à l'Histoire des Prix de 1381 à 1794*. Commission Royale d'Histoire, 1902.

⁵⁶ Hauser, H., *Recherches et Documents sur l'Histoire des Prix en France de 1500 à 1800*, 1936.

⁵⁷ Elsas, M. J., *Umriss Einer Geschichte der Preise und Löhne in Deutschland*, Erster Band, 1936.

⁵⁸ Jacobs, A., and H. Richter, "Die Grosshandelspreise in Deutschland von 1792 bis 1934." *Sonderhefte des Instituts für Konjunkturforschung* Nr. 37, 1935.

⁵⁹ Pribram, A. F., *Materialen zur Geschichte der Preise und Löhne in Oesterreich*, Band 1, 1938.

⁶⁰ Beveridge, W., and others, *Prices and Wages in England from the Twelfth to the Nineteenth Century*, Vol. 1, Price Tables: Mercantile Era, 1939.

⁶¹ Bujak, F., *Badania Z. Dziejów Społecznych i Gospodarczych*.

⁶² Hamilton, E. J., Money, prices, and wages in Valencia, Aragon, and Navarre, 1351-1500, *Harvard Economic Studies*, 51: 261-269, 1936.

Hamilton, E. J., American treasure and the price revolution in Spain, 1501-1650, *Harvard Econ. Stud.*, 43: 226-260, 390-392, 1934.

foods, or of similar groups have been prepared. Jacobs and Richter,⁵⁸ as part of their study of prices in Germany, presented indexes of prices of agricultural products including crops, animals, and animal products, from 1792 to date.

As a part of his study, Hamilton⁶² prepared index numbers of agricultural products and several sub-groups for Valencia, Aragon, and Navarre, Spain, from 1351 to 1500. Similar indexes were published for Andalusia, New Castile, Old Castile-Léon, and Valencia, from 1501 to 1650.

Pedersen and Petersen⁶³ presented prices of several farm products from 1855 to 1913 for Denmark. Similar prices were published for Sweden⁶⁴ covering the period 1861 to 1930.

Some of the well-known indexes of price levels in European countries include sub-groups, heavily weighted by farm products. Limitations of space preclude a discussion of them. In general, they are not of much value to those studying farm prices specifically.

World Index Numbers of Farm Products

With the ever-expanding interest in the price problem, various students have attempted to compare indexes of identical farm products in different countries and to measure the world level of prices of farm products.

In 1919, Mitchell⁶⁵ published indexes of wholesale prices of 34 identical food products in England and in the United States covering the period 1913-1918. Bowley and Smith⁶⁶ calculated indexes of prices of foods based on 16 identical products for 11 individual countries. Kondratieff⁶⁷ published index numbers of wholesale prices of agricultural products in gold from 1786 to 1924 for the United States and England. None of these studies combined prices in the different countries to form a world index.

⁵⁸ Pedersen, J., and O. S. Petersen, *An analysis of price behaviour during the period 1855-1913*, Inst. of Econ. and Hist., 1938.

⁶⁴ Wages, cost of living and national income in Sweden, 1860-1930, *The Institute for Soc. Sci., Univ. of Stockholm*, 3 (2): 53-54, 110, 111, 1937.

⁶⁵ Mitchell, W. C., *International price comparisons*, United States Department of Commerce, p. 19, 1919.

⁶⁶ Bowley, A. L., and K. C. Smith, *Comparative price index-numbers for eleven principal countries*, London and Cambridge Economic Service Special Memorandum, No. 24, pp. 6-9, July, 1927.

⁶⁷ Kondratieff, N. D., *The dynamics of prices of industrial and agricultural commodities*, *Farm Econ.*, No. 67, pp. 1380-5, August, 1930.

The Statistisches Reichsamt⁶⁸ published a world index of food materials covering the period since 1925, on a post-war base. In 1937, Warren and Pearson⁶⁹ presented index numbers of 18 foods including six grains, six livestock and livestock products, and six other foods for seven countries and the world, from 1910 to date.

This article has not attempted to discuss the many studies of supply, demand, quality, margins, technique of calculation, and similar problems. A comprehensive review of these problems has been prepared under the direction of Black.⁷⁰

⁶⁸ *Wirtschaft und Statistik*, Jahrgang 15, Nr. 6, p. 222, March 1935.

⁶⁹ Warren, G. F., and F. A. Pearson, *World prices and the building industry*, pp. 55-57, 1937.

⁷⁰ Black, J. D., Editor, *Research in prices of farm products*, Soc. Sci. Res. Council, Bul., 9, June, 1933.

Black, J. D., and B. D. Mudgett, *Research in agricultural index numbers*, Soc. Sci. Res. Council, Bul. 10, March, 1938.

DEVELOPMENTS IN CROP AND LIVESTOCK REPORTING SINCE 1920

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Agricultural Marketing Service

THE scope and character of agricultural statistics for the United States have moved forward in keeping with the needs of the times, as nearly as one can judge from the written record. As the United States developed into the world's granary, producing wheat, oats, corn, and cotton for exportation abroad, primary statistical interest centered upon the statistics of production and crop prospects of the principal export crops. Annual estimates of production and monthly reports of crop prospects during the growing season provided the base for agricultural operations, and supplied the basis for establishing prices of exportable commodities.

By 1910, the Department¹ was issuing quantitative estimates of acreage, production and value for 13 crops, condition reports for 23 crops and for pasture, and annual inventory estimates for 5 species of livestock. With the passage of time, the growing importance of the domestic market for agricultural commodities called for additional and more precise information concerning the crops for which reports had been made, and called for information concerning additional crops, concerning crop prospects prior to harvest, and concerning the prices that farmers were receiving for the farm products they were selling. As a result, quantitative forecasts during the growing season and monthly estimates of prices received were begun just before the World War.

By 1920, estimates of production were made for 29 crops and for wool, condition was reported for 44 crops, and annual inventory reports were made for livestock. Estimates for additional crops and livestock commodities have been initiated, one by one, until at the present time, quantitative

¹ In this paper, "Department" is used to mean the crop and livestock reporting agency of the United States Department of Agriculture: Division of Statistics, 1862-1903; Bureau of Statistics, 1903-1914; Bureau of Crop Estimates, 1914-1921; Division of Crop Estimates of the Bureau of Markets and Crop Estimates, 1921-1922; Division of Crop and Livestock Estimates of the Bureau of Agricultural Economics, 1922-1939; Division of Agricultural Statistics of the Agricultural Marketing Service, 1939-.

estimates and progress reports are made for 141 crops, including separate reports by kinds, and for 15 livestock items.

The World War brought many economic problems relating to the production and supply of agricultural commodities and saw the development of additional reports on perishable commodities and the expansion of reports upon stocks of commodities. The period of declining agricultural prices that followed the World War brought increased demands for more precise information which would enable agricultural leaders to more intelligently plan programs to alleviate the distressed condition in which agriculture found itself, and to bring about more stable production and more stable prices.

As the farmers of the United States became more and more dependent upon the domestic market for the sale of their products, the competition between the various producers for the consumer's dollar became more intensive. The demand for statistics concerning agricultural production, probable and accomplished, increased tremendously. These demands were so evident to the Congress that increased funds for specific commodities or for general expansions were provided from time to time, and the scope and character of the basic agricultural statistics were correspondingly increased.

Individual-farm Samples Used for Acreage Estimates

An important improvement in estimating technique which has taken place almost entirely since 1920 is the gradual substitution of "individual-farm" data for "judgment" data. Judgment data were the chief source of information used in preparing reports prior to 1920. Thus, the estimated corn acreage in July was based upon reports from farmer correspondents giving their judgment of the acreage in corn in their localities in the current year, expressed as a percentage of the preceding year. Each reporter was expected to embody in his report allowances for varying acreages per farm, as well as for varying acreage changes from the preceding year as among farms.

Problems of precision in weighting and handicaps because of lack of clerical help to tabulate large numbers of sample reports were minimized in this approach to the problem.

Precision in the estimate, which depended upon an accurate appraisal of the change in crop acreage, was hardly possible because the reporter was unable to gauge the change more closely than 5 to 10 per cent. The general tendency not to report in excess of 100 was another of the inherent statistical difficulties involved in the use of such data. As early as 1908, inquiries had been directed to cotton farmers asking for individual cotton acreage planted on their farms. During November of each year from 1912 to 1914, and thereafter in August, reporters were asked to report the actual acres of the various crops grown on their farms in the current year and in the preceding year. Although the results of these inquiries were available for the annual review of crop acreages made in December of each year, during the experimental stage the statisticians necessarily continued to place their main reliance upon the judgment inquiry. Technical defects in construction of questionnaires needed attention during these experimental years in order to develop inquiries that would articulate with the estimates prepared and published by the Crop Reporting Board. Questions of tabulation, editing, weighting, and the representativeness of the samples were all involved. It was not until about 1926 that the individual-farm indication of acreage change came into full use for all crops.

The first study of the relative merits of judgment and individual-type inquiries was reported at a regional meeting at Madison, Wisconsin, in 1920.² In that study, the Assessors' annual enumerations of acreage served as the basis of comparison of the judgment inquiries and the individual-farm inquiries, made in May of 1919 and 1920. The study definitely disclosed the limitations of the judgment form of inquiry in that it apparently failed to register the full increase or full decrease from year to year, and sometimes even failed to denote the direction of change. The individual-farm inquiry itself was found generally to somewhat overstate the acreage in the current year in terms of the preceding year, but there were indications that the degree of bias (used here to include

² Becker, Joseph A., *The Individual Farm Report in Estimating Acreage*. Mimeographed report, Bur. of Markets and Crop Estimates, U. S. Dept. Agr., March 18, 1922.

cash crop bias, selectivity of sample, etc.) could be measured. In 1923, another bias study was made of the individual-farm data on cotton acreage, by States, which were available as far back as 1915. This study disclosed the superiority of the individual-farm inquiry over the judgment inquiry, but showed more variation in bias than did the data for Wisconsin.

In 1924, the annual inquiry on acreages of crops grown (made each August) was discontinued in favor of the Rural Carrier Survey made in September. In making these surveys, the rural mail carriers leave questionnaire cards regarding acreage in the boxes of farmers on their routes and collect them when they have been completed by the farmers. This change in date and method of collection shifted the reporting unit definitely to a harvested base from a base which had previously been somewhat of a mixture of plantings and harvestings. This shift proved to be a fortunate one because of the material expansion of acreage of crops which was underway at that time in the Great Plains Area. Varying percentages of the planted acreage are abandoned in that area from year to year, and it is important that the samples definitely relate either to planted acreages or to harvested acreages.

The year 1925 saw the innovation of a country-wide individual-farm inquiry with respect to acreage at planting time. For the first few years, the inquiry was made during May, but since then it has been made during June. Throughout the years, the inquiry has aimed to ascertain the acreage of the various crops which the individual farmer had harvested, or expected to harvest, in the current season. It related thus to acreages remaining for harvest of fall- and winter-sown crops and of early-sown and early-maturing crops, to acreages planted of crops seeded during the late spring, and to acreages intended for late planted crops. Because the historical series of estimates primarily related to acreages harvested and to yield on harvested acreage, the July estimates of acreage relate to acreage for harvest and not to acreage planted. Data are being accumulated, however, with respect to plantings, and estimates have been published of the planted acreages of 11 crops for the years since

1929. To meet the growing need for estimates of acreages planted to other crops, schedules of inquiry are being adapted to provide sample information necessary to making the change.

In many States, annual enumerations of acreages are made by the local tax assessors. In all these States, crop reporting is carried on as a cooperative undertaking and the Department has participated in the development of these enumerations.

In April 1923, the first report on intended acreages of crops was published. As early as April 1917, a judgment-type survey of intended crop acreages had been made for the use of the Government but not for publication. These intentions-to-plant reports are intended primarily to provide farmers with information in time to permit a change in plans when the aggregate reported plans take the form of excessive increases or decreases. The 1923 intentions report³ related to 9 principal spring-sown crops, including cotton, and was based upon individual-farm data. The report indicated farmers' intentions to increase cotton acreage by 12 per cent. It caused considerable activity on the Cotton Exchanges and apparently brought about some reduction in cotton prices. Therefore, it was adversely criticized by some as being grossly inaccurate. As a matter of fact, the increase in acreage that was finally planted—as ascertained in July and confirmed by the production for that year—was greater than the increase shown in the reported intentions. Perhaps no more dramatic validation of a statistical report was ever made. But in the next session of Congress, legislation⁴ was enacted prohibiting future reports of this character regarding cotton, on the ground that the effect of such reports was likely to be more harmful than beneficial.

Technical development has taken place in connection with the intentions-to-plant reports as a background of experience has been accumulated. The first reports of intentions-to-plant merely set forth the percentages derived from the samples. About 1929, it became obvious that a definite overstatement of total intended crop acreage was present in

³ Weather, Crops and Markets, April 28, 1923.

⁴ Act May 3, 1924 (43 Stat. L115).

the data, probably attributable to the innate optimism of reporters. Accordingly, the 1931 report pointed out that certain allowances must be made for observed departures between intentions and final harvestings. In 1932, farmers reported an intention to grow an acreage of spring wheat 53 per cent greater than that harvested in 1931. Because of heavy abandonment in 1931, the large increase in the acreage for harvest actually represented only a slight increase in acreage planted. This incident pointed to the desirability of establishing a series of estimates of planted acreage to serve as a basis for the reports on farmers' intentions. By 1938, a sufficient series of estimates of acreage planted had been accumulated to introduce a further innovation by relating the intentions to a planted base. In that year the intentions-to-plant report came into its own as a report of "prospective plantings," in which the reported intentions were interpreted in relation to actual plantings.

Yield Estimates Based Largely on Judgment Reports

Judgment data with respect to yield per acre continue to be used in the preparation of estimates of final yield per acre. For a considerable number of commodities, judgment inquiries still serve as the only basis for yield reports. Their continued use for this purpose is justified by the findings of extensive comparisons of returns from this type of inquiry and yields derived from Census returns.⁵

In 1929, the Department initiated its annual yield inquiries based on individual-farm samples for principal crops, some 25 in number, in which the individual farmer is asked to report the acreages harvested (or to be harvested) and the total production in terms of bushels, tons, pounds, etc. This type of inquiry had been employed in scattered States, notably the New England States, as early as 1926. Judged by comparisons of the yields derived from these inquiries with the yields derived from the 1929 and 1934 Census data, this yield information based on individual-farm samples is slightly superior to that drawn from the judgment type of inquiry. The correlation between the two series, however, is

⁵ Sarle, Charles F., Adequacy and Reliability of Crop-yield Estimates. Tech. Bul. 311, U. S. Dept. Agr., June 1932.

very high, and considering the greater ease and speed of tabulation, the reported yields based on judgment serve a very valuable purpose in arriving at preliminary estimates of yield per acre.

Changes in final yield estimates indicated by the individual-farm yield reports are ordinarily small. Such changes occur principally when the reporter's judgment of yield becomes befogged by his attempt to allow for abandonment of planted acreage, when he is unable to weight yields as between large and small fields, or when he is unable to allow for great variation in yields as between fields in the area covered by his observations. In the compilation of the judgment returns also, it is frequently impossible for the compiler to make adequate allowance for the variations listed above. These statistical difficulties tend to be minimized in the individual-farm type of yield information, but a new form of bias is introduced in that yields for individual farms tend to be above the average, because reporters are above-average farmers.⁶

Development of Graphic Analysis

Development of the new series of data with respect to crop acreages and crop yields has been paralleled by development in methods of appraising the current returns. Generally speaking, both the acreage and production shown by the Census, and therefore the derived yields per acre from Census totals, are taken as bench marks in preparing the estimates of agricultural production. In the early 1920's, reported yields for Census years were set down side-by-side with Census derived yields, and allowance was made in the current estimates of yield in line with the spread shown in the several States between reported yields and Census yields. But when this spread differed as between two or more of the Census years, there was a question of what allowance was proper to bring the estimates for the current intercensal year into agreement with the Census level of yields.

Use of dot charts of relationships, which began about

⁶ It is interesting to note in passing that as early as 1899, this type of acreage and production questionnaire was used in the Bureau of Agricultural Statistics although no records are extant as to how the data were compiled and utilized in arriving at estimates of acreage or yield.

1928, made possible more precise interpretations of current yields in terms of the Census level. In like manner, the use of charts in connection with indications of acreage have made it possible to determine more precisely the current acreages and their relation to base years. Thus, the usual indication of change in acreage is called the "current-historic" percentage. It is derived from the aggregate acreage of a crop reported by a group of reporters as for harvest on their farms in the current year and the acreage of the crop reported on the same schedules as harvested in the preceding year. It is thus a comparison of what farmers have harvested or expect to harvest with what they remember or choose to remember as harvested in the preceding year.

When these current-historic indications of change have been plotted in comparison with the actual changes, a whole series of relationships have been discovered. For some crops, because of cash-crop bias, this percentage has regularly understated the current year's acreage. Cash-crop bias occurs, for example, when farmers tend not to report increases in cash-crop acreages which might cause a reduction in prices; this may take the form of not reporting at all. For other crops, the current-historic percentage has regularly overstated the change. For still other crops, the relationship understates at one end of the scale and overstates at the other. In some instances, the relationship appears to be non-linear.

Dependent upon the time of the year in which the inquiry is made, the current-historic percentage, involving as it does the element of a memory report for the preceding year, must be used with full knowledge of the developments during the preceding year. Thus, in a year following heavy abandonment, the June inquiry frequently understates the increase in the acreage to be harvested because some reporters report as harvested in the preceding year, fields or parts of fields that were actually abandoned before harvest. An improvement designed to eliminate the effects of faulty memory of this nature is the use of the so-called "identical" indication. In this indication, the acreage reported in the current year is tabulated in conjunction with the acreage previously reported

for the same farm. This is done by picking out the returns from the same farms in two successive years and tabulating them together. The identical indication undoubtedly gives a superior measure of the change in standing acreage from a date in one year to approximately the same date in the succeeding year. But it is subject to certain errors in that the acreages for both years represent expectations at the time and do not fully reflect (1) plantings, if abandonment has already occurred or (2) the harvested acreage if there was subsequent abandonment. The identical indication, however, has been of great utility in connection with the preparation of estimates of planted acreage. For the States in the Great Plains Area, in which abandonment is frequently substantial, the July estimate of acreage for harvest now is essentially an estimate of acreage planted with an allowance for probable or usual abandonment.

Charting of relationships between the sample and the Crop Reporting Board's estimates has been particularly helpful. In the "ratio to land" approach in estimating acreage, the current aggregate acreage of each crop, expressed as a percentage of the total farm land of the farms reporting, is plotted for each year against the Board's estimated acreage for each year and against the Census acreage in Census years.⁷ This approach has the obvious advantage of placing the estimate for each year in independent relationship to the Census years, since it is not affected by data for any other year, and ordinarily does not involve allowances for abandonment. The problems involved in the use of the ratio approach largely have to do with proper weighting, securing samples of sufficient size so that the ensuing ratio will be statistically significant, and attaining a comparable degree of representativeness of the samples from year to year. The method is particularly valuable in revealing cumulative errors that are likely to occur when the estimate for each year is based on the estimate for the preceding year. It is, however, subject to serious error where the total acreage in

⁷ This approach is generally credited to E. A. Logan, late Statistician for Missouri. The "ratio-relative," in which the ratio to land for each year is divided by the ratio to land for the preceding year to secure an indication of acreage change, was first used by Nat C. Murray and S. A. Jones about 1916.

farms is changing or where successive samples include variable proportions of non-crop land.⁸

Development of Objective Counts

The first objective counts relating to acreage apparently were made about 1916 by B. B. Hare, Statistician for South Carolina. He began the practice of counting the number of fields of cotton, corn, and other important crops in his State from the train window. In the spring of 1921, his "field counts" showed only about one-half as large a reduction in cotton acreage as did other indications. Neither Mr. Hare's nor the Crop Reporting Board's confidence in this relatively untried kind of information was strong enough to give it much weight in preparing the June 25 estimate of cotton acreage in cultivation. The final ginnings, however, validated the indication of smaller acreage reduction and drew sharp attention to the possibilities of such means of estimating acreage. Following upon this experience, experimental counts of fields and telephone poles opposite fields were made during the early 1920's by Statisticians in other States.

In 1923, D. A. McCandliss, the Statistician for Mississippi, constructed the first crop meter or frontage meter for use on automobiles, and began making measurements of road frontages of various crops in Mississippi. The use of such instruments has increased until now 54 are operated by the Department. The technique for taking measurements and recording and interpreting the results has become standard procedure.

Objective samples of growing crops for use as indications of probable yield derived from such factors as fruiting, stand, etc. are difficult to collect on a comprehensive scale. In 1925, Frank Parker of the North Carolina office submitted a plan for counting numbers of plants and bolls of cotton and making other objective measurements of the cotton crop. Since 1928, regular employees have collected such data on fruiting,

⁸ These problems are naturally increased at present by the fact that the universe from which these samples are drawn is made up, from year to year, of sub-universes of farmers participating and of farmers not participating in the Agricultural Adjustment Administration's programs. Unless the successive samples include proper proportions of participants and non-participants, both the indications of year-to-year changes and of relative acreages in the various crops may be misleading, and not entirely comparable from year to year.

stand, etc. for cotton. Shorter series are available for wheat and corn. It is anticipated that continued exploration will be made in this field. These objective samples indicating probable cotton production, now available for the period since 1928, show a reasonable degree of correlation with final yields per acre. Those collected during the month of August have been useful as supplementary indicators of probable yield, when the September Cotton Report is being prepared. In like manner, those collected during September have been utilized in preparing the report as of October 1. Objective counts of number of bolls, etc. have also been reported by individual farmers, and these have served a useful purpose as supplementary indications of probable yield.

Development of Forecasts of Production

The first quantitative statement of probable production made by the Department related to the winter wheat crop of the United States.⁹ In June 1914, State figures were incorporated for the principal crops. The main reliance of the Crop Reporting Board in preparing crop-progress reports during the growing season is the "condition" of the various crops as reported by farmers. The reports of condition are furnished to the Department monthly during the growing season by crop reporters who appraise the current promise of yield in their neighborhood. During recent years, the Department has also secured from crop reporters near the close of the growing season for each crop, a statement of "probable yield." Both "condition" and "probable yield" as reported for preceding years are charted against yields as finally determined, and a degree of relationship is established for use in interpreting the current condition reports.

Use of condition reports has undergone gradual development. Prior to 1912, the condition of crops was published without official interpretation of the indicated yield. From 1912 until 1929, the reported condition of various crops was interpreted in terms of indicated or forecast yield per acre on the basis of pre-established pars. These pars were determined on the basis of past relationships of condition for the

⁹ Crop Reporter, May 1912.

given date and final yield per acre. Essentially, the par was an equivalent of the normal, or 100 per cent, yield per acre, which was multiplied by the currently reported condition, to obtain the forecast yield per acre. The pars assumed a one-to-one relationship, which was frequently not confirmed by dot charts in which each reported condition was associated with the yield per acre for that year. It was decided, therefore, to discontinue the use of pars and to read the forecast yield per acre from the dot charts. This decision was inevitable as the Board began to use other indicators of crop prospects than the condition report.

Full public attention was drawn to this change in the policy of the Crop Reporting Board at the time the Cotton Crop Report for August 1927 was issued. In that report,¹⁰ the Board announced that it had departed from the basic pars and had made allowance for potential weevil damage, which was apparently not adequately reflected in the reported condition. This departure resulted in an estimate which was considerably below the reports of the private crop estimators. But as the season advanced, it became obvious that the departures had been in the direction of a more precise forecast of probable cotton production. The final report of cotton production—12,956,000 bales in comparison with the August forecast of 13,492,000 bales—was convincing proof that the condition report needed additional interpretation if the Board was to provide the most dependable service.

A large number of individual studies have been made in which weather conditions are independently related to yields in the past years. A considerable number of charts have been developed, also, in which weather data are utilized in conjunction with reported condition to give additional indications of probable yield.

In nearly every one of the past 10 years, prolonged and extreme drought conditions have been experienced in one or more States. In the Great Plains States in particular, these droughts have caused extensive abandonment of spring-sown crops. As previously mentioned, it has been necessary to devise means of preparing estimates of planted acreage

¹⁰ Crops and Markets, August 1927.

and acreage abandonment for many crops. The studies that have been carried on during this period have shown the need of monthly estimates of probable abandonment as a factor influencing the current forecast of production, particularly since reporters, after several months, tend to forget the loss of planted acreage and tend to confine their reports of condition and of yield per acre to the acreage remaining for harvest or actually harvested. In recent years, through the use of the reported condition, including the reports of failure, it has been possible to approximate the probable final abandonment and to prepare forecasts of yields per acre that carry an allowance for this important factor.

Regionalization of Inquiries

With the passage of time, an increased specialization in the production of crops and in the production of livestock products has developed in the United States. This development led to an increased inter-regional movement of agricultural commodities, which in turn led to an increased interest in the statistics of production, probable production, and sales. One instance in recent years was the development of early potato producing sections in the southern States, where formerly very few Irish potatoes were grown. These potatoes were produced during the spring months and were marketed before the Department prepared its first estimate as of July 1. Recognition of the need for current information led to the publication of commercial early potato forecasts beginning as early as January in Texas and Florida. Similarly, forecasts of production for some fruit crops are prepared before the harvesting of these crops in the southern States.

At one time, a uniform schedule of inquiry concerning condition and yield of various crops was used throughout the United States, except that for the most part cotton has been separately reported from the beginning. In some States, information regarding the condition of certain crops was asked in some months when the crop had already been harvested and the yield determined. Because of the length of the harvesting season from the Rio Grande to the Canadian Border and from the Delta of the Mississippi to the Plateaus of

Wyoming, it became evident that the dates of inquiry should be staggered to fit the time of harvest. As early as 1914, separate questionnaires were in use for Florida and California. In 1924, separate questionnaires were provided for the northern and southern States. This regionalization of inquiries has gone on until at the present time the United States are grouped into 17 groups.

The schedule dates for reports of yield per acre for the several crops were originally fixed on the first of the month following the completion of harvest for the entire United States; thus the preliminary estimate of yield per acre of the small grains was set for October 1 because harvesting ordinarily was completed in North Dakota during September. For the grain crops, the completion of harvest contemplated the completion of threshing. Prior to the date of the preliminary estimate of yield, crop correspondents were asked to report the condition of the growing crop or the condition at time of harvest.

In 1924, a series of inquiries was initiated to be made in the month preceding the month of the final inquiry regarding yield, asking the crop reporter to give his estimate of the "probable" yield. Ten years of experience with this type of inquiry demonstrated that it gave figures that were superior to the condition figures under many circumstances: as when the bulk of the crop had been harvested, when there had been serious abandonment of acreage early in the season, and when new factors like increased fertilization or the introduction of higher yielding varieties had become important. Consequently, reporters are now asked for their judgment of probable yield per acre simultaneously with their report on condition for some crops for two successive months prior to the date of the final yield inquiry. The regionalization of inquiries and the use of the probable yield inquiry have made it possible to prepare more precise reports of indicated yield per acre at an earlier date than was possible under earlier methods.

*Fruit Production Estimates Based
upon Modified Par System*

Estimates of fruit-crop production have been based upon judgment reports from crop reporters and fruit growers at

time of harvest concerning the current year's production expressed as a per cent of a full crop. The reported percentage in a Census year, divided into production, gives 100 per cent or par production for the Census year. The production for the intercensal years is ascertained by applying the currently reported percentage figure to the par production of the most recent Census year with allowance for trend. The indicated production for each year is checked against the estimates built up from records of carlot shipments, motor truck movement, and allowances for such items as home consumption, waste, and loss. During recent years, a very large volume of information concerning shipments, purchases by processing plants, and the like, has become available. These data have made it possible to prepare estimates for each year, which, when divided by the percentage production figure for that year, give a par production figure similar to that obtained by the use of Census data.

During the growing season, condition of fruits is reported monthly, and these are correlated graphically with the season-end percentage of production figures. The interpreted percentage of production is applied to the par production for the current year. This procedure is analogous to plotting condition against yield per acre of field crops. Except in a few States, estimates of acreage of bearing and non-bearing trees are not made from year to year, but the Census data on bearing and non-bearing trees are useful in indicating future trends of production.

During the past two decades, a tremendous expansion in the acreage and number of bearing trees of citrus fruits in Florida, California, and Texas has necessitated extensive studies to ascertain the trend of total bearing surface. Tree surveys for apples and peaches made in 1928,¹¹ in which data relating to production and numbers of trees of each age were collected from large number of orchardists, gave more precise information for determining weighted trends of production than had previously been available. Similar surveys have been made in scattered States since that time. In 1935 and 1936, extensive surveys¹² were conducted in the Pacific

¹¹ Youngman, W. H. Apple Tree Plantings, Yearbook, U. S. Dept. Agr., 1931, pp. 101-104, pp. 719-724.

¹² Blair, R. E., W. R. Schreiber, and C. N. Guellow, California Fruit and Nut Acreage Survey, Agric. Adj. Adm., Stat. Publ. No. 1, Jan. 1938; Borum, C. J.,

Coast States in cooperation with county horticultural authorities and the local WPA organizations. These data have been invaluable in appraising potential production for use in preparing current forecasts. In 1910, no reports of production were prepared for fruit crops although condition reports were made during the growing season for apples, peaches, pears, grapes, oranges, and lemons. By 1920, estimates of production were prepared for apples, peaches, pears and oranges in addition to monthly condition figures for these and other fruits. At the present time, reports on condition, forecast production, and production are prepared for 21 fruits and 4 tree-nut crops. In addition, estimates for a number of these crops are broken down to show production for certain important varieties or variety groups.

*Commercial Vegetable Crop Reports
Require Field Observation*

During and since the World War, the production of vegetable crops has increased greatly in areas favorable for their production. Centers of production for one or more early vegetable crops have been developed from New Jersey to Florida, westward as far north as Kansas, and to the Pacific Coast. Products from these areas are in competition with each other and with the storage supplies from the preceding year in the northern States. In each of these areas, producers are vitally concerned with the extent of production and the dates of probable movement from other areas which precede and follow them in harvesting and shipping. In many instances the shipping period in these areas is of short duration and the information must be furnished promptly to be of maximum service. Although information is gathered by questionnaire, just as in the case of the field crops, much information for these crops must be gathered by personal visits at opportune times during the growing seasons. At present, reports on condition and forecasts of production, intended acreage, acreage planted and acreage harvested are prepared for 26 vegetable crops, including potatoes and sweet potatoes, and for peppermint. Separate reports are made concerning the production of 11 vegetables for canning

Paul C. Newman, and C. J. Heltemus, Pacific Northwest Fruit and Berry Survey, issued in 16 mimeographed reports, Bur. of Agr. Econ., 1937-38.

or processing. Reports for most of these commodities are made twice a month during the season when they are of importance in particular areas.

Estimates for Livestock Largely Developed Since 1920

The statistical work of the Department in regard to livestock has expanded greatly since the early 1920's. This expansion has been along two lines. The first has been in the quantity of work done as measured by the number of estimates or reports made and by the variety and volume of records collected and organized from primary and secondary sources. Most of this expansion took place before 1930. The second has been in the quality of the work done as measured by the improved techniques developed for organizing and interpreting sample data and the improved methods used in maintaining records. This expansion has occurred largely since 1930.

Before this expansion of the 1920's, the reports on livestock were limited chiefly to estimates of inventories; the principal ones related to the number and value of the different species on farms as of January 1, by States. Estimates of the production of wool were prepared and annual estimates of the quantities and values of livestock and livestock products were included in the reports of agricultural production (see page 825). Judgment reports from crop reporters as to the percentage change from the previous year for their localities formed the principal source of information used in making estimates of livestock numbers. However, a beginning had been made in 1919 in getting individual farm reports as of January 1 covering numbers "this year" and "last year," from which percentage changes could be computed, and in 1920 to get the current year's numbers of each species separated into age and sex classes. In 1918, a list of special livestock reporters was built up. These reporters submitted monthly reports of numbers on their farms at the beginning and end of the month and the items of increase (births and purchases) and the items of decrease (sales, slaughter, and deaths) during the month.¹³

¹³ From changes shown by these samples, monthly tables were prepared showing changes in numbers from month to month over the year. Although these indications of change were not dependable, because of the small size and non-representativeness

During and following the World War the need of and demand for more adequate information concerning livestock numbers and concerning the production of livestock and livestock products grew apace.¹⁴ The post-war declines in prices of livestock and livestock products brought heavy losses to both producers and packers. And out of this situation grew insistent demands that something should be done to help stabilize the livestock industry, both as to production and as to marketing. But when attempts were made to analyze the situation in order to get a factual basis for adjustment or control, the lack of adequate information on livestock production and marketing became quickly apparent. As a result, numerous requests were made to the Department of Agriculture and to the Congress for action that would make possible the collection and dissemination of more of this kind of information on livestock.

These requests came to a Secretary of Agriculture who had first-hand knowledge of the problems of livestock producers—Henry C. Wallace. For many years he had been the Secretary of a well-known midwestern livestock organization, and had been closely associated with other livestock and farm organizations. During the World War, he was one of the producer committee that worked with the Food Administration on matters having to do with livestock marketing and prices. Hence, these requests had unusually sympathetic reception in the Department. Increased appropriations were made by Congress for expanding not only the livestock work but also the other statistical work, even in the face of the prevailing policy of both Congress and the new Administration to liquidate much of the war-time increase of Federal activities and personnel.

In 1922, a special livestock section was set up in the Divi-

of the sample, these records did give very useful information on the relative size and monthly distribution of births, deaths, and farm slaughter.

¹⁴ This was a period of rapid organization of farmers into general and commodity bureaus, unions, associations, and cooperatives. In the livestock industry this movement was reflected in the phenomenal development of local livestock shipping associations, the beginning of the invasion of stockyard markets by cooperative selling agencies, and the setting up of special livestock sections in general farm organizations. During this period, the packing industry, both as organized in the Institute of American Meat Packers and as individual packers, began to establish or greatly expand commercial research organizations.

sion of Crop Estimates, and the name was changed to the Division of Crop and Livestock Estimates. Before deciding on the work to be undertaken by the new livestock section, a number of conferences were held in different parts of the country attended by representatives of the Department, of farm and livestock organizations, of marketing agencies, of railroads and of packers. At these meetings the character of information needed was fully discussed. As a result, a program of reports was decided upon, and the reports were gradually established during the next few years.

Among the first problems to be decided was that of the kind and source of information to be used in making livestock estimates. At the time the enlarged livestock program was being established, there was a growing opinion among the statisticians in the Washington office of the Division that individual farm reports from a fairly large number of farmers, selected more or less at random, should give better indications of change than those furnished by a limited number of crop reporters giving their opinions as to changes in their own localities.

In the early months of 1922 when the post-war depression in agriculture was near its worst and the plight of farmers was a matter of great concern as they became more vocal, Postmaster General Hubert Work inquired of Secretary Wallace if there was any way in which the postal force might be of help and expressed a willingness to make their services available. The Secretary repeated this conversation to Dr. H. C. Taylor, the Chief of the newly constituted Bureau of Agricultural Economics. Dr. Taylor immediately suggested that, in view of the uncertainties in the hog situation, a survey of hog producers might be made through the rural mail carriers to secure information concerning the relative size of the 1922 spring pig crop. W. F. Callander, who was then acting in charge of the Division of Crop and Livestock Estimates, developed the system of securing sample data from farmers through the rural carriers. He devised a card inquiry relating to individual farm operations, and suggested that each carrier be instructed to leave a card with each of 10 farmers along his route, and collect the completed returns.

A cooperative arrangement was made with the Post Office

Department and preparations were soon underway for the first Rural Carrier Survey. This first survey was made in April 1922 in all of the North Central States and in three eastern and three southern States. Returns from a large number of farmers were received and tabulated, and in June 1922 the first Pig Survey Report was issued.¹⁵ This first survey was also notable in that the questionnaire carried a question on the intentions of farmers as to fall farrowings in 1922. The report based on this inquiry preceded by nearly a year the first published intentions-to-plant report for crops.

In December 1922, a similar pig survey was made through the rural carriers in all of the States, and similar spring and fall surveys have been made each succeeding year. For the first few years, the questions on the survey cards were limited to hogs and pigs. But as the advantages of this method of getting adequate individual-farm samples became more apparent, other questions regarding livestock were added, and within a few years most of the information as to the number of livestock on farms, size of the pig crop and lamb crop, and production of wool was obtained from the Rural Carriers' Livestock Survey. At the present time, important information on milk cows, milk production, and chickens is also obtained through these surveys. As previously stated, the rural mail carriers began the distribution and collection of crop acreage cards in September 1924 and have continued to make these acreage surveys each fall since that time.

During the first 10 years of the Rural Carriers' Livestock Surveys, the schedules were of the current-historic type with questions relating to numbers in the current year and in the preceding year. The principal indication of change was the percentage that the current year's numbers were of the preceding year's numbers. As usual with this type of inquiry, there was an indeterminable element of memory bias in the reports for the previous year, which tended to be exaggerated in some years when the price of hogs was low or declining. During this same period, the survey items for different species were separately tabulated—that is, the cards reporting hogs, for hogs; those reporting cattle, for cattle, etc. Thus,

¹⁵ Weather, Crops and Markets, June 24, 1922.

the only average number per farm for any species was the average per farm reporting that species. This tended to eliminate the effect of the changing proportion of farmers keeping each species, which in some years might be of considerable importance.

During these first 10 years, the published reports showed the results of the survey as actually tabulated by States as percentages of the previous year, with the average number of pigs saved per litter as computed from the returns. The 1930 Census, which showed as of April 1, the number of sows farrowed or to farrow in the spring season of 1930, provided a basis for actually computing the size of the pig crop. Beginning with 1932, quantitative estimates of the number of pigs saved have been published. At about the same period, the questions on the schedule card were changed by eliminating all historical questions and confining the questions to numbers in the current year. Methods of editing and tabulation were changed, in that cards not usable for one species were eliminated for all species and all items on the cards were listed at the same time. This made possible the computing of an average per farm for each species per livestock farms tabulated, as well as per farms reporting each species. To secure a direct comparison, reports for identical farms were also tabulated. In preparing estimates, there are now available indications of change in the average number per livestock farm, change in the average number per farm reporting each species, and change in the absolute numbers on identical farms.

Another of the initial activities of the livestock section was that of developing methods for getting adequate information as to the movement of livestock by States, by months. This was needed for determining both the total and seasonal movements from and into individual States, and the sources of the total commercial supply of livestock by months and seasons. This involved getting monthly records as to the State of origin of receipts from stockyard companies and from direct-buying packers, records of cars of livestock received and forwarded by stations from railroads, records of brand inspections covering shipment from States, and records of sanitary inspections covering shipments into and

(in some cases) shipments from different States. Wherever possible, records were obtained back to January 1920.

These records are now available for a period of almost 20 years. The records for each State are maintained in the branch office in that State and the records for all States are maintained in Washington. During these years, changes have had to be made in the methods of obtaining these records. In the early years, a very large proportion of all livestock movements went through public stockyards. Since about 1925, a constantly increasing proportion of slaughtered livestock has gone direct to packers and has not moved through stockyards. The number of direct-buying packers has also increased markedly and this has involved getting records of the movement either from these packers or from other sources. Also, the shift from rail to motor truck transportation of livestock has materially reduced the value of rail records—so much so that records of station receipts and forwardings have been discontinued in many States. Likewise, the movement of stocker and feeder cattle and sheep through public stockyards has become a continually decreasing proportion of the total movement, whereas the movement direct to feeders, both by rail and truck, has greatly increased. This has necessitated developing other methods of getting information as to such movement.

These records of livestock movements from and into States are used in the preparation of annual balance sheets for the different species of livestock by States. These balance sheets show as debit items the number on hand at the beginning of the year, the number born, and the number shipped into the States; and as credit items, the number shipped out, slaughtered on farms or locally, and death losses. The difference between the sum of the debit items and of the credit items is the number at the end of the year. These balance sheets are the basis for computing estimates of the quantity and value of livestock production and income from livestock. The preparation of such balance sheets and estimates was started about 1926 and the estimates are available by States from 1924.

By about 1930, the methods of getting information from producers as to changes in livestock numbers had become

sufficiently standardized so that comparable indications of changes from year to year since that date are now available. These indications of change can be compared with estimated changes that are based upon records of assessments, shipments, Census enumerations, and other information used in revising preliminary estimates. The series of yearly indications is now sufficiently long to make possible the charting of these comparisons. In general, two types of charts are used—line charts, on which all indications of change and estimates, all related to a base year, are shown on one chart; and dot charts, on which each indication of change from one year to the next is separately charted against estimated changes.

Although sample returns obtained by rural mail carriers tend to be more random in character than returns made by a regular list of crop or livestock reporters, they do not form a true cross-section sample in which all sizes and types of production are proportionately included. But the kind of farms sampled tends to be fairly similar from year to year. This arises from the fact that voluntary reports on livestock numbers can be obtained from only a portion of producers. If schedules were sent to all producers each year, only a part of them would ever reply and the ones that did reply would reply fairly regularly. It is from this segment of "replying" producers that the rural carriers' sample is obtained; and although this segment is not an exact cross section of all producers, the changes on these farms are thought to be fairly typical of changes on all farms. Hence, these sample returns are used to estimate relative changes and not to build up a total.

Dairy and Poultry Estimates Now Cover Comprehensive Field

Although milk and poultry and egg production are among the most valuable of all agricultural products in this country, estimates have been made only in quite recent years. Prior to 1920, a judgment inquiry concerning production per milk cow for the preceding year was made on the January questionnaire to general crop correspondents. The returns showed a very large dispersion and were affected by memory bias.

They were used, however, in preparing the first estimates of milk production.¹⁶ Quarterly inquiries, tried experimentally in Wisconsin during the early 1920's and used in preparing estimates of milk production, showed similar deficiencies. Carefully worded inquiries on annual production per cow and on utilization of the milk were fairly successful as a basis for county estimates in New York, and they have been continued.¹⁷ In 1923, monthly individual farm questions on "milk cows on hand" and "milk produced yesterday" were tried experimentally on the general questionnaires to crop reporters in Wisconsin,¹⁸ and these inquiries were extended to the entire United States in the fall of 1924. Such individual-farm samples for one day of each month have been taken regularly since that time, and form the principal basis of monthly reports of milk production per cow and annual estimates of milk production.

The first quantitative estimates of milk production for the United States, by States, were published in March 1930 as part of the income report for the period 1924 to 1928.¹⁹ Estimates of numbers of milk cows on farms on January 1 were already available as the first step in ascertaining the average annual number of producing cows. With the establishment of a dairy section in the Division in 1931, annual estimates of milk production and utilization were continued and a start was made toward collecting information on rate of feeding, production practices, utilization of milk on farms, and other items of use in appraising the dairy situation. Many supplemental inquiries have been made which are designed to provide greater precision in the estimates of production. Recent reports show data on manufactured dairy products, whole milk consumption, etc., expressed in whole milk equivalent in comparison with the estimates of production. The monthly reports of numbers of dairy cows, and occasional reports concerning heifers of various ages, and intended dates of

¹⁶ Callander, W. F., Bul. 14, Wis. Dept. of Agr., Feb. 15, 1918.

¹⁷ Shepard, John B., and Roy L. Gillett, Bul. 158, Dept. of Farms and Markets, New York State, September 1923.

¹⁸ Nyhus, Paul O., A study of a statistical method for measuring current milk production, Mimeographed report, Bur. of Agric. Econ., 1924.

¹⁹ Farm value, gross income and cash income from farm production, mimeographed report, Bur. of Agric. Econ., March 1930.

freshening provide a picture of present and probable future trends in dairy production.

The taking of an individual-farm sample of hens and of egg production for one day of each month was begun in the fall of 1924, simultaneously with the similar sample for milk cows and milk production. No general inquiries concerning egg production were made before this date. The January 1 livestock inquiries beginning in 1919 had provided for a report of chickens on farms, but no estimates of poultry numbers had been made.²⁰ Series of sample data on hatchings, home use, sales, and death losses had to be developed before a basis of reports on chicken production could be attempted. The first estimate of chickens on farms and egg production for the United States, by States, also was a part of the income report published in 1930.²¹ It was 1931 before a poultry section was established in the Division and a well-rounded program of regular estimates of production and utilization of chickens, eggs, and turkeys was undertaken. Current monthly reports of the number of chickens on farms, and of young chickens on hand on the first of each month from April to July, now provide a panorama of the present and future trend of chicken and egg production.

Estimating milk production and egg production involves problems not encountered in making estimates of either crop production or livestock numbers. In the case of individual crops, usually only one crop is harvested each year and this harvest takes place during a well-defined season. It is necessary only to estimate acreage and yield per acre to ascertain production. In the case of milk and eggs, however, production is continuous throughout the year and the "crop" is harvested every day. Not only that, but the basis of production (cows milked and hens in flocks), and the rate of production (milk per cow and eggs per hundred hens) changes from month to month. Hence, the estimation of production involves the preparation of monthly estimates of both the number of producing units and the rate of production.

²⁰ The general inquiry on chickens on farms and special annual inquiries on chicken and egg production were the bases of the estimates of chicken numbers, chicken production, and egg production for Wisconsin published in Bul. 34, Wis. Dept. of Agr., 1921.

²¹ See note 19.

Information used in making these monthly estimates comes largely from monthly reports made by regular crop reporters. There is no Census base for these monthly estimates and few records of market utilization, particularly for poultry, are available for checking purposes. The Census reports of total annual production are of only limited value as a basis for estimates of annual production since information as to continuing and variable production collected by Census methods from farmers sometime after the close of the year can hardly be expected to furnish accurate figures. But such reports are of value in showing regional differences in rate of production.

Data on turkey numbers have been collected fairly regularly since 1929. The first comprehensive report on production, sales, etc. was released in September 1939.

Estimates of Disposition and Time of Marketing Basic to Agricultural Income Reports

In the days when paramount importance of crop reporting was considered as centered in commercial crops, particularly crops for export, an attempt was made to measure the volume of the commercial movement. Crop reporters were asked in March each year to report their judgment of the percentage of the preceding year's production that was shipped out of the county where grown. The reported shipments out of county have proved to be useful in making historical determinations of sales of the various crops comparable with present estimates of sales which are now determined on the basis of special inquiries on crop disposition. Crop disposition inquiries underlie the estimates of quantities of crops sold and quantities of crops used in the farm household, and these, in turn, when evaluated at season average prices, underlie the estimates of income from agricultural production. The long record of reports of shipments out of county have enabled the Department to prepare estimates of sales running back to pre-war years. In like manner, series of inquiries to operators of country mills and elevators concerning monthly receipts of grain from farmers were the forerunners of the present series of estimates of monthly purchases from farmers. These estimates are used to com-

pute weighted averages of prices received by farmers, and ultimately to measure the amounts of money that farmers receive in each month; in other words, to measure monthly farm income.

George K. Holmes, a member of the staff of the Bureau of Statistics, saw the need for estimates of the production and value of livestock and livestock products as well as for crops, and he began the preparation of estimates of production and value of livestock and livestock products. Apparently such estimates were prepared as early as 1908, and were incorporated in a report on "Wealth Production on Farms," which was published in the Statistical Abstract for that year. In that issue, a total value of crops and livestock combined for the United States was shown for 1897 and for each year from 1900 to 1908. A similar report appeared annually until 1913. In the Statistical Abstract for 1913, and in the Yearbook of the Department for 1913, separate totals for crops, for livestock, and for crops and livestock combined, were published. Beginning in 1916, an annual report was published currently in the January issue of the "Monthly Crop Reporter." No estimates by States were prepared at that time. The estimates were prepared by commodities for the United States as a whole, but no separate estimates by commodities were published.

Apparently the first State estimates of quantity and value of livestock production were those published for Wisconsin in 1918.²² These naturally led to the preparation of estimates of quantity and value of chicken and egg production,²³ and then to the preparation of estimates of income from agricultural production for Wisconsin for the 4 years, 1917 to 1920.²⁴ In compiling these estimates, gross income related to the sum of the value of livestock products and the value of crops, less crops fed to livestock.²⁵

In March 1924, the report on value of farm production

²² See note 16.

²³ See note 20.

²⁴ Becker, Joseph A., Bul. 34, Wis. Dept. of Agr., 1921.

²⁵ Defined in Bul. 48, Wis. Dept. of Agric., 1922. More recent income estimates for the United States also exclude from income other products used in the farm business, such as seed, eggs for hatching, etc.; and allow for waste, or loss of crops, mortality of livestock, and for increase or decrease in livestock inventories during the year.

for the United States prepared by Mr. Holmes included a combined total value of United States production of crops and livestock, excluding value of crops fed to livestock. At that time, the ground work was laid for the comprehensive series of estimates of disposition and income from the sale of agricultural commodities. The first step in the preparation of such estimates involved the determination of the disposition of each commodity to segregate the quantities that were consumed by the farm family, and the quantities that were sold, excluding seed, feed, and waste.

A series of disposition inquiries was inaugurated in 1925 for most crops at the same time that such inquiries were developed for livestock and livestock products. By 1929, a sufficient background of data had been collected to make possible the preparation of estimates of value and income from crop and livestock production for the 5 years, 1924 to 1928, which were published in the September and October 1929 issues of "Crops and Markets."²⁶ As additional disposition information has been collected, it has been possible to ascertain relationships between production and sales for recent years. These relationships in turn provide bases for extrapolating estimates of sales from the estimates of production for earlier years. During the past two years, reports of disposition from 1909 to date have been issued for cotton and cottonseed, grain crops, and hay, and similar reports are in course of preparation for the other crops.

*Well-rounded Service on Agricultural
Statistics Now Available*

By progressive steps, series of timely reports have been developed which encompass most of the important segments in the broad field of agricultural statistics. Reports are available upon intended, planted, and harvested acreage, and upon probable and final yields of crops. Other reports relate to the number of livestock on farms, and to the calf, pig, lamb, and colt crops. Still others relate to prospective and

²⁶ Details of crop and livestock disposition and some discussion of the methods employed followed in a mimeographed report: Farm value, gross income and cash income from farm production, Bur. of Agric. Econ., March 1930. This report showed disposition, price, value, and income for 78 crops and 14 livestock items. Similar reports were issued annually until 1936.

accomplished production of crops, livestock and livestock products, and to the farm disposition and time of marketing of these products. Finally, the development of the agricultural industry is measured by reports on prices received by farmers, and the evaluation of production, sales, and home consumption of these numerous agricultural commodities. Further details have been furnished to meet specific demands and needs of the farmers and the consumers of farm products. Many gaps in the information series still exist, and numerous problems in technical approaches still remain to be explored. But every year in the last twenty has seen some significant development, and similar progress may be expected in the future.

ESTIMATING LOCAL MARKET PRICES AND FARM LABOR SINCE 1920

ROGER F. HALE

Agricultural Marketing Service

SEVENTY-THREE years ago, the first systematic attempt to assemble statistics on prices received for agricultural products at local farm markets was inaugurated; and the United States Department of Agriculture made plans for its first year-end report on crop production. Then, as now, the value of the year's harvest was of great interest. To provide a means for the determination of these values, nine questions regarding prices were added to one of the monthly crop schedules. This marked the beginning of the annual series of December 1 crop prices¹ and the launching of the first Nation-wide price reporting service.

The interest in local market prices of agricultural commodities in those early days was not confined to crops. The January 1 schedule in 1867 inquired as to per head values of livestock. This originated the annual evaluation of livestock inventories which is still a feature of present-day agricultural statistics. In the early months of the same year the assembly of data on wage rates represented the first steps to be taken in the collection of per unit costs of the expenses of production.

From these small beginnings, there has been built up a comprehensive local market reporting service for price and labor statistics. This currently covers prices of over 500 commodities and information on the volume of agricultural employment and supply and demand, as well as on the wages of farm labor.

Estimates of prices received by farmers as of December 1 of each year reflected annual changes in the agricultural price level fairly well, but, in general, they differed materially from the average level of prices during the entire crop marketing season. Furthermore, December 1 prices did not meas-

¹ Crop prices were collected as of January 1 prior to 1872, but have been published and customarily considered as equivalent to averages prevailing one month earlier.

ure the seasonal swings in prices of crops which generally reduced the returns to farmers for crops at harvest time.²

In 1908, facilities permitted the addition of questions on monthly prices of the principal crops to the general crop schedule. Special questionnaires were designed and circularized in 1910 to obtain mid-monthly local market prices of meat animals and livestock products. The need for per unit costs of commodities bought by farmers also appeared at that time to supplement the information on wage rates; consequently, the reports on prices paid by farmers for commodities used in production also were collected and, in addition, prices of commodities used for living. The interest in labor statistics was further stimulated as a result of shortages of farm labor during the World War. Crop correspondents were asked to report the supply of and demand for farm labor beginning in 1918.

Early sources of information: The first mailed inquiries regarding local market prices received by farmers were sent to crop correspondents as part of the general crop schedule. This information was the source of all December 1 crop price indications, January 1 livestock inventory values, and farm wage rate indications. Local market prices of the principal crops were solicited from regular crop reporters on the general crop schedule as of the first of each month during the first 15 years after this service was started in 1908.

Special lists of local merchants and buyers of agricultural produce were developed two years later as a source of information on monthly prices of minor crops, livestock and livestock products. Supplemental lists of merchants also were circularized for the first time in 1910 for information on prices paid by farmers for a long list of items purchased by farmers.

Nature of basic data: Price estimates made by the Department since 1866 have been based primarily upon voluntary returns to mailed questionnaires. For the major farm commodities, little, if any, bias has been apparent in the samples of returns from surplus areas of production when checked

² Peterson, Arthur G., Index number of prices received by farmers for farm products, 1910-1935, U. S. Dept. Agr., B.A.E., Washington, D. C. Sept. 1935 (Mimeographed) pp. 12-13.

with quotations on the central markets at which the commodities are ultimately sold. To give proportionate weight to sales in surplus and deficit areas of production, the sample has been stratified by counties and by price reporting districts with weighted averages of district prices providing the basic indication of the State-wide level of prices for specific commodities.

The size of the sample has been increased substantially in recent years. In October 1924, for example, only 35 reports were received from Kansas on the price of wheat. Systematic efforts to obtain the cooperation of additional local mills and elevators increased the number of reports three-fold in the following year. In recent years, an effort has been made to obtain at least 25 reports on major commodities from each district, of which there are ordinarily 9 to a State.

The dispersion of the sample shows no significant change as the number of reports is increased, intrastate variations in local market prices being determined primarily by the location and extent of surplus and deficit areas of production, distance to primary markets and other factors. A fairly representative geographic distribution of the returns has been obtained for all inquiries. When the number of returns was increased, therefore, indicated averages with greater precision were obtained.³ Effort has been directed toward the attainment of sample indications producing averages with a relative probable error of one-half of one per cent or less for local market prices of all major commodities bought and sold by farmers. Averages of prices reported paid for feeds⁴ and prices received for cotton and grains have reached this goal of precision in many of the States where these products are important articles of trade. On the other hand, State averages of hay or apple prices, and prices paid by farmers for furniture may show a relative probable error of 3 to 5 per cent in many cases at the present time.

Changes in Techniques

Techniques employed in the handling of sample data from

³ Sarle, Charles F., Reliability and adequacy of farm-price Data, U. S. Dept. of Agr., Dept. Bul. 1480, pp. 20-42, Washington, D. C., March, 1927.

⁴ Sabin, A. R., and R. F. Hale, Prices paid by farmers for bran, U. S. Dept. of Agr., B.A.E. (Multilithed) pp. 65, Washington, D. C., Aug. 1938.

voluntary reporters, in general, have proved sound, and, consequently, it has not been necessary to change them materially since the price and labor reporting service was started years ago. Returns from voluntary reporters have quite generally been increased in an effort to minimize the errors in the averages resulting from the dispersion inherent in the universe of inquiry. Various technical improvements have been incorporated in the sampling procedure from time to time, for the most part to increase representativeness.

Prices received by farmers: The problem of improving the representativeness of local market price reports on farm products has been attacked from several different angles. Early in the twenties the solicitation of price quotations for principal crops on the general farm schedule was abandoned and the questions of prices received for corn, wheat, etc., were transferred to monthly questionnaires sent to mills, elevators, and local dealers in other farm products. The change tended to increase the sensitivity of the returns to changes in local market prices, eliminating the lag quite prevalent in reports from farmers during the slack months of each marketing season. This has made the returns more indicative of the actual price level on mid-monthly dates.

Further improvement has been accomplished through the refinement of weighting factors. Prior to 1924, straight averages of reported prices were made for the State as a whole for many items of secondary importance. There is some tendency for the samples to be self-weighting, returns being received roughly in proportion to the intensity of production. There is no assurance, however, that proportionate representation will be obtained month after month with a voluntary reporting system. There is grave danger that sampling fluctuations will distort unweighted averages to a serious extent.

After 1924, weights were applied to district price averages of practically all commodities to obtain State averages of prices received by farmers. In the twenties, census acreages were quite frequently used as weighting factors for district crop prices. Because of differences in yields as between districts, production figures have been substituted for acreage weights in recent years. At present, census or other sales

data are employed wherever available on account of differences in the proportion of the production sold as between areas of surplus and deficit production. Since a sale is necessary to establish a price, sales data should be employed throughout as weighting factors. Until such time as activity in the field of agricultural statistics is expanded to include current estimates of monthly sales of individual farm products by price-districts, it will not be possible to employ a more rational basis for current weighting practices. It is planned, however, to substitute current sales estimates for production estimates as weighting factors in the determination of national averages of State price estimates as soon as historic series can be revised and facilities provided for the preparation of current sales estimates by States.

Efforts to improve the representativeness of sample indications also have led to the abandonment of mid-month price estimates for milk in favor of averages for the month as a whole. In many milksheds, prices of milk for fresh consumption are changed but once a month, while prices of milk for manufacture are shifted in accord with changes in butter or other milk product prices. The proportion of sales at each price⁵ is often determined only at monthly intervals. Summarization of per unit returns by utilization classes on the basis of a single composite price thus is significant only for the month as a whole. The determination is quite logically obtained through the derivation of price from total purchases by dealers and total payments to farmers. Its application to the estimation of annual averages of wool prices on the basis of returns from growers in Range States also has met with success.

Another development in the estimation of annual prices has been the substitution of marketing season averages for the December 1 prices of crops. December 1 is too near the seasonal low point for many crop prices to provide an adequate indication of the actual average of prices received throughout a given crop marketing year. Over a period of years, December 1 and crop season prices of cotton do average about the same. Average December 1 prices of wheat,

⁵ Sarle, C. F., Reliability and adequacy of farm price data, U. S. Dept. Agr., Bul. 1480, Washington, D. C., March 1927, p. 58.

however, are somewhat lower, while December prices of corn are materially below the crop season average price level. Therefore, in 1934, this long relied upon indication of annual price changes was laid aside.

The demand for averages of prices of farm products by districts within a State has stimulated further consideration of geographic stratification of the sample. Rearrangement of price-reporting district boundaries has been made in several instances to realign them with the boundaries of marketing areas. The changes effected during the past 15 years tended to isolate the more homogeneous areas, reduce the dispersion in district averages, and thereby increase the dependability of the State averages. For some products, such as milk, wool, and potatoes, special districts have been designed to segregate further the commercial areas of production and to reduce the upward bias resulting from the averaging of a rather uniform geographic distribution of returns from both surplus and deficit areas of production in the same standard price-reporting district. Intrastate price-districts for tobacco have been outlined in conformity with crop type areas.

Geographic stratification of the sample for areas smaller than the price-reporting district is not practicable currently because of the relatively small number of reports secured from correspondents. In 1930, special county estimates of farm commodity prices were prepared for the Bureau of the Census for use in the evaluation of 1929 crop production and livestock inventories as of April 1930. Special facilities were provided by the Census at that time, however, to permit a substantial increase in the number of returns to the price inquiries regularly mailed to crop and price correspondents and to supplement this information with data from special mailed questionnaires and field surveys. Facilities have again been provided by the Census Bureau for the preparation of county price estimates in connection with the Agricultural Census of 1940.

Reclassification of the age and sex groupings of livestock in 1926 has permitted a decided improvement in the weighted averages of January 1 per head values of livestock. Stratification of returns by method of sale permits the control of dispersion arising from differences in the level of prices re-

ceived by farmers for products sold at different points in the marketing system. This procedure has been utilized in the development of series of equivalent per unit "on-tree" returns for special needs of the Marketing Agreements Section of the Agricultural Adjustment Administration.

Prices paid by farmers: The necessity for the improvement of sample indications on local market prices of articles bought by farmers has been brought to the forefront in recent years by programs for the reestablishment of agricultural prices and farm income at parity with pre-war prices and income. Basically, however, many of the problems of estimation are similar to those encountered in estimating prices received by farmers. In consequence, technical developments in the estimation of prices paid have followed rather similar lines.

During the present decade, more representative national averages of prices paid have been obtained through the use of weighted averages of State prices in place of a straight average of all individual returns from the country as a whole. Before 1938, these weights had been only general indicators of differences in quantities of different items purchased by farmers. Data on farm population had to be used as State weights for many consumption goods. Only recently a Bureau of Home Economics survey of typical rural areas has provided regional weights for quite a few items. Crop acreages have been employed as State weights for prices of some of the production goods such as seeds and farm machinery. Progress in the determination of average annual purchases per farm for a wide range of individual items has been made with the use of mailed questionnaires sent to comprehensive lists of farmers in Wisconsin, Illinois, and other North Central States in recent years by field offices of the Agricultural Marketing Service.

Beginning in 1927, a decided improvement in the representativeness of returns was made by stratification of the mailing lists of local dealers in commodities bought by farmer in accord with the type of goods handled. Lumber yards were no longer sent a general questionnaire requesting prices of food, clothing, furniture, building materials, and miscellaneous items bought by farmers. Each group of dealers

became reporters only for prices of items handled generally by their type of firm.

The representativeness of annual price averages also was improved in the early twenties by the substitution of quarterly inquiries for annual mailings of questionnaires. Mailed inquiries as to annual price averages tend to be biased by the level of prices at the time the questionnaire is put into the hands of the respondent or by the level of prices in the recent past. This is particularly true with respect to sensitive commodities in nearly all years and all commodities during periods of rapid price changes. To obtain an adequate current measurement of prices paid for the most sensitive group of commodities, monthly sampling of feed prices was started in 1934. Last year, monthly enumerations of prices paid by farmers in 25 towns, in which field offices of the Agricultural Marketing Service are located, permitted the estimation of the level of prices paid for most items at monthly intervals.

Stratification of returns by types of retail outlets serving the farm trade is one of the new developments designed to strengthen the reporting system for prices paid by farmers. Prior to 1935, a single indication of the level of prices was provided by a straight average of quotations received from all reporting firms. The segregation of chain-store returns from reports of independent stores has permitted some limitation and control of the dispersion in the sample. The development of the mail-order price series has completed the coverage of the principal retail outlet serving farmers. A survey showing the proportion of farm trade going to each type of store has produced weights for the combination of these strata into one single average which is vastly more representative of the actual level of prices than indications based on returns from independent stores alone. Lack of facilities for the revision of historic series to this basis, unfortunately, prevents the adoption of these improved averages for use currently in index number construction.

Recent regionalization of questionnaires and revision of item specifications also has been a factor of some importance in limiting sample dispersion and in the consequent improvement of basic indications of prices paid by farmers at inde-

pendent stores. Of more importance, perhaps, is the offset to the dispersion in the universe provided by an increase in the number of returns. The large volume of returns from a Civil Works Administration enumeration conducted in 1934 permitted a more nearly exact measurement of geographic differences in prices of specific items bought by farmers. The construction of reliable spatial indexes of prices of articles bought by farmers for living, in cooperation with the Social Security Board⁶ has been made possible by the increased returns to regularly mailed inquiries.

Farm labor statistics: To date, the development of estimating techniques in this field has probably been neglected more than in any other. Indications of the seasonal variation in monthly and daily wage rates were not available until the shift from annual to quarterly wage inquiries was made in 1924. Supplementary information on piece-work rates was collected first in 1920 with the inauguration of the inquiry regarding cotton-picking rates. Information on other harvest rates was not collected until the special survey of 1935 and not repeated until 1938.

The development of farm employment estimates has been the greatest contribution to this field. Beginning in April 1918, series of reports from crop correspondents concerning the supply of and demand for farm labor in their respective localities provided data for the derivation of supply-demand ratios. Today these ratios are undoubtedly the best current indicator of changes in rural unemployment. Not until 1920, however, were actual data on farm employment collected currently from crop reporters. This service was started in Wisconsin in cooperation with the Industrial Commission and, a few years later, was extended to other States.

After publication for a long time in terms of persons employed per 100 crop-reporter farms, estimates of total farm employment were constructed in 1937 in cooperation with the Works Progress Administration.⁷ The preparation of these estimates involved correction for the unrepresentative-

⁶ Armstrong, Florence A., State differentials in prices paid by farmers for family living, Soc. Sec. Bul. (11): 9. Social Security Board, Washington, D. C., November, 1938.

⁷ Shaw, E. E., and J. A. Hopkins, Trends in employment in agriculture, 1909-36. Rpt. A-8, WPA Nat. Res. Proj., Philadelphia, Pa., November, 1938.

ness of crop-reporter returns in two respects: First, an adjustment downward in per farm employment to the census level on census dates; and second, an amplification of the seasonal swing in reported figures on the basis of shifts in employment indicated by the results of special farm-management surveys. These adjustments were necessitated by the fact that crop-reporter returns covered not only larger than average farms but mainly general crop and livestock farms with smaller than average seasonal shifts in labor requirements.

Refinements in estimating techniques have been developed during the past year with the help of the Works Progress Administration of New York City. These improvements involve (1) the stratification of the voluntary sample on the basis of employment per reporting farm as of the first of each year; (2) matching of reports from identical farms in successive months with the January returns; and (3) weighting of average per farm employment in each strata with the proportion of farms in the respective sections of the universe on the last census date. This procedure has the dual advantage of limiting the effect of the wide variation in the universe by stratification and weighting, and of avoiding the upward bias occurring when employment reports for successive months are matched. Apparently respondents are more reluctant to report labor layoffs than accessions.

The feasibility of this new method of estimating regional changes in farm employment has been demonstrated but its current adoption unfortunately must be delayed until more adequate facilities are provided to handle the clerical work involved. Future demands for reasonably precise State farm employment estimates for use in the administration of relief and other action programs will call for indications based on an enumerative sampling rather than on a voluntary reporting procedure. Plans for the monthly enumeration of farm employment in selected areas already have been drawn.

FUTURE IMPROVEMENT IN AGRICULTURAL STATISTICS

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PRESENT day economic problems are a mirror that reflects probable future developments in agricultural statistics. An increasing degree of accuracy is essential. A broader scope and a greater geographic detail in current statistics are required in many fields of human activity and especially in agriculture.

The administration of the many "action" programs of the government in recent years has called for county estimates of acreages and yield per acre for important crops such as cotton, wheat, corn, tobacco, peanuts, rice and potatoes. County estimates of farm income are needed by the FCA, REA and FSA. Big business corporations with nationwide selling organizations have been asking for county estimates of farm income for a decade or more.

The demand for county estimates of acreage and yield per acre for important crops has been met by the Agricultural Marketing Service since the beginning of the AAA and Crop Insurance programs by using available sample data on crop acreages and yields, including the data obtained in connection with the operation of these programs. None of these data are fully adequate nor satisfactory for use in making reliable county estimates. The samples obtained from voluntary crop correspondents are not of sufficient size to justify county estimates and, furthermore, such samples are not representative of all types and kinds of farmers. The data obtained by the AAA are in most instances from participating farmers only, and such data could not be considered as representative of the year-to-year changes in acreage taking place on farms of nonparticipating farmers. Reliable county estimates of crop and livestock production are an essential step in making dependable county estimates of farm income.

Accurate monthly estimates of the number of unemployed by States, including both the rural and urban populations, are needed as the basis for allocating billions of dollars of Federal funds for relief and relief-work. The monthly esti-

mates of farm employment by States should be improved as well as expanded to include rural nonfarm employment and rural unemployment. At the present time, available estimates of employment, both rural and urban, are based on selective samples from voluntary reporters.

Under present-day conditions with the facilities available and with the techniques of sampling and estimating now used, it is difficult to require the governmental agencies responsible for agricultural and employment statistics to produce the kind and quality of statistics needed.

Another important problem is that of forecasting the yield per acre of important crops as far in advance of harvest as possible. The earlier in the season that crop failures or bumper yields can be anticipated the better the individual farmer can adjust his farming operations to meet the new situation. It would be ideal if reasonably reliable forecasts of yield per acre could be made prior to planting time. If dependable forecasts of yields are to be made much easier than is now possible with existing techniques, it will be necessary (1) to know the relationship between yield per acre and weather and (2) to be able to forecast the weather, or at least the extremes of weather, for several months in advance.

During the last three years a program of research has been carried on by the U. S. Department of Agriculture to determine how estimates and forecasts of agricultural production could be improved from the standpoint of accuracy, scope, timeliness and greater geographic detail. One phase of this program has been an investigation of the possibilities of long-range weather and crop forecasting. Another phase has been in the field of sampling, with special emphasis on data relating to the varied activities of the individual farm and with objective methods of sampling agricultural phenomena. The third step has had to do with developing and refining the methods of estimation used in connection with types of sample data now available. This program of research involves the active cooperation of several Bureaus of the U. S. Department of Agriculture, other Departments of the Federal Government, a considerable number of the State Experiment Stations and Agricultural Colleges and several other educational and research institutions.

In the field of meteorology, the first step was a critical evaluation of most of the alleged methods of long-range weather forecasting from both the physical and statistical standpoints. Unfortunately, none of these methods of forecasting weather appears valid or useful except the methods which forecast for 5 to 10 days in advance.¹ Basic research in meteorology, however, has been undertaken that has practically doubled the knowledge in this field of science within the last 2 or 3 years. Research of this kind is essential as a foundation in the development of reliable methods for forecasting the weather for periods of one to several months in advance.

In a number of States, studies of the relationship of weather factors to yield per acre of several important crops have been made. In these studies monthly averages of weather data and average yields for the entire State were used. Although some of these studies have shown a high relationship for the period of years covered, the forecasting formulas developed seldom have proved satisfactory when actually used for predicting in seasons not included in the original study.

During the last three years, research of a more intensive nature has been undertaken by using data of weather and yield obtained from the records of State Agricultural Experiment Stations. Moreover, special field plot experiments designed for the purpose of studying the effect of weather and soil moisture on the growth and yield of corn, wheat, and cotton at specific locations have been started in cooperation with a number of State Agricultural Experiment Stations. This crop-weather research carried on in cooperation with agronomists and plant physiologists is basic to an understanding of how variations in weather do influence rate of growth and yield per acre of these crops. Very little systematic knowledge is available at the present time in this field so important to the agricultural statistician who is charged with the responsibility of evaluating the effect of current weather on production as the growing season progresses toward harvest time.

¹ Reports on, Critical studies of methods of long-range forecasting. Sup. 39, Mo. Weather Rev. (In Press.)

Sampling and Estimating

Both the experience of the U. S. Department of Agriculture in making estimates and forecasts of agricultural production and the results of recent research in sampling and estimating indicate that improvement in accuracy of agricultural statistics will come about by further development of technique along four general lines as follows:

1. By the use of more precise methods for observing agricultural phenomena.
2. By the greater use of more objective methods of sampling.
3. By increasing the size of samples.
4. By increasing the objectivity of the methods used in estimating and forecasting from sample data.

The trend during the last two decades has been toward the use of more precise methods of observation. The individual farm sample has replaced the judgment type of sample in estimating acreage and livestock numbers. The crop meter has been developed as a means of measuring year-to-year changes in the acreage of important crops. The highly objective direct count or measurement type of observation is being tried out in connection with estimating year-to-year changes in yield per acre and in forecasting the yield of a number of important crops. The stand and boll counts for cotton, ear counts and measurements for corn, head samples of wheat from a definite area of $1/5000$ of an acre, hill samples for potatoes and peanuts are being made by the agricultural statistician himself or by someone trained for the work. Some of the more simple observations of this kind are made also by the crop reporters.

The matching of current acreage or livestock reports from identical farms from one year to the next is another method of obtaining greater precision in the indications of change from one sample to the next.

The subjective judgment type of observation and even the individual farm sample are always subject to the personal bias of the reporter. This bias may be either deliberate, as is the case when the report relates to some of the important cash crops, or unintentional when faulty memory or lack of

knowledge leads to a false report. The sample involving the direct counts or measurements is an effort to obtain greater accuracy and objectivity in the individual observations and to avoid these biases due to personal judgment of the observer.

The methods of sampling now available to the U. S. Department of Agriculture are subjective in that psychological factors play an important part in determining the farms that can be included in a sample obtained from voluntary unpaid correspondents. The sample is selective in that it is representative only of those classes of farmers who will voluntarily reply to a questionnaire they receive in the mail or to a card that is left in their mail box by the Rural Carrier. A large number of farmers—nonresident farmers in parts of the wheat belt, tenants that move frequently, farmers with a poor education or who are not familiar with the English language and those of a highly suspicious nature—seldom become regular crop reporters and are not likely to respond to the Rural Carrier surveys.

Although this selection of better-than-average farmers is an advantage in the case of judgment inquiries, such a method is not satisfactory for securing data relating to individual farms. The established methods of sampling individual farms that are available to the U. S. Department of Agriculture are subjective rather than objective; consequently, the samples obtained are selective and not representative of all kinds and classes of farms.

When the State crop estimator takes a crop count or measurement type of sample, he has the opportunity of using objective methods in selecting the routes along which he will take observations and of choosing the fields and points within the fields for sampling.

For example, in taking the pre-harvest head samples of the 1939 wheat crop in the Great Plains States, objective principles were followed in so far as possible. Routes were laid out in a grid pattern with the length of the routes in each county proportionate to the land area of the county. Fields for sampling were selected every two or three miles of wheat frontage along these routes, as measured by the crop meter. The two points of entry into these fields and the location of the

two samples within 25 to 125 paces of the road were determined at random. A rectangular steel hoop, open on one side, comprising an area $1/5000$ of an acre, was used in designating the sampling unit from which the heads of wheat were clipped.

These route methods of sampling are, however, limited in their use to acreage, yield, and quality of crops. They are not applicable to livestock numbers, income, farm employment, or other items relating to the farm as an operating unit.

The logical way to overcome this difficulty of selectivity of acreage and livestock samples is to provide for an enumerative sample or "sample census" each year. Paid enumerators would obtain information with respect to acreages of the various crops and to the number of the different kinds and classes of livestock from a sample of individual farms or small groups of farms by personal interview. Dependable statistical methods of stratification and randomization could be used in designing a sample that would be representative of all kinds of farms in an area. This method of conducting an enumerative sample has been tried experimentally with good results, but it is much more expensive than obtaining a sample by mail or with the help of the Rural Carrier.

Two papers in this issue of the Journal (by G. W. Snedecor and R. J. Jessen) present some of the principles applicable in objective sampling of individual farms.

For more than 50 years the trend has been in the direction of increasing the size of the samples for the purpose of improving the accuracy of the estimates. Merely increasing the size of a biased sample, however, is not sufficient. What is needed at the present time for making estimates for areas smaller than a State is a much larger sample of farms taken in person by paid enumerators rather than a larger sample of voluntary returns obtained by mail. Research to date indicates that even a 25 per cent sample is not large enough to give serviceable accuracy to county estimates of acreage and livestock numbers.

If the samples used as a basis for estimates of agricultural phenomena could be taken with statistical objectivity and the individual observations could be reasonably precise and free from bias, the problem of estimating would be very sim-

ple indeed. Unfortunately, the methods of sampling and type of observations now available have many shortcomings. The agricultural statistician, when making an estimate from the one or more samples, is forced to consider the averages, or ratios obtained from the samples as "indications." These indications need to be (1) kept as mutually exclusive or independent as possible, (2) corrected for bias and (3) combined objectively in making an estimate.

Considerable improvement in the accuracy of estimates could be made, even from samples now available, if greater attention were to be given to developing more objective methods for handling the sample data in making estimates. The recent study on the use of sample data of farm employment, as described by Roger F. Hale, is a case in point. The matching of each monthly sample of farms with the sample of the previous January, the stratification of farms within the sample on the basis of the number of persons employed on January 1 and the use of weights derived from the 1935 Federal Census, greatly improved the monthly estimates of farm employment. Well-defined methods of weighting the various indications would improve the comparability of the estimates from year to year, and would be especially valuable when personnel changes occur in the organization. The reciprocal of the square of the standard error of estimate of each of the indications, after correction for bias, could be used in weighting a number of independent indications.

Concluding Observations

The ever increasing demand for more and better statistics relating to agriculture in its many phases can be met in large part by the two governmental agencies chiefly responsible for these statistics—the Agricultural Marketing Service of the U. S. Department of Agriculture and the Bureau of the Census of the U. S. Department of Commerce—by the development and practical use of objective methods of sampling and estimation.

Three specific suggestions for using objective sampling methods in strengthening agricultural statistics were made by the writer in a previous paper² as follows:

² Sarle, Charles F., Development of partial and sample census methods. Proc. Farm Econ. Assoc., December, 1938.

(1) Use a split schedule in census enumerations to broaden the scope of basic agricultural statistics by 50 to 200 per cent.

(2) Take a rotating partial census in intercensal years in commercial fruit and truck areas to obtain more reliable and more useful basic statistics regarding these specialty crops than is possible in connection with a general enumeration.

(3) Take a nation-wide annual enumerative sample of individual farms or groups of farms covering crop acreages and production, livestock numbers and production.

In looking into the future it is not difficult to visualize a return to the county statistical reporter as the source of much of the sample data on which estimates concerning agriculture would be based. He would be given part-time employment and would lose his job if he failed to make the required reports regularly and conscientiously. Very little of the data submitted would be based on his judgment or opinion alone.

Several times a year he would take an enumerative sample of individual farms in his county—an objectively designed sample of representative farms or groups of farms. He would obtain information concerning these farms as operating units—crop acreages, production and sales, and numbers, production and sales of livestock. Each month he would have variously assigned duties—the taking of head samples of wheat in one month, cotton boll counts or ear counts for corn in another month, and perhaps depth of soil moisture another month. Each month he would report on prices received and prices paid by farmers, numbers of persons employed and, perhaps, rate of egg and milk production as well, on sample farms within the county.

He also might obtain a record of purchases of farm products by local buyers and processors and of shipments out of the county by rail and truck of agricultural products to be used with other data in estimating farm income by counties.

Such a program would be more expensive than the present system of voluntary unpaid correspondents but the more efficient administration of State and Federal action programs made possible by the resulting statistics would be worth many times the increase in cost.

DESIGN OF SAMPLING EXPERIMENTS IN THE SOCIAL SCIENCES¹

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Looking Back

THE history of sampling is the history of statistics. On the theoretical side, that statement is trite—statistical theory is the theory of sampling. In practice, however, sampling has had a checkered career, its progress being much less uniform than that of statistics as a whole. In earlier times statisticians dealt with samples perforce, the greater part of their skill being directed to the extraction of reliable information from batches of pertinent data upon which they came more or less by chance. Following a find, they often made efforts to improve the sources of such data. Gradually they began to dream of complete enumerations. After many years, and with differing degrees of success, the census, together with relatively complete records of certain social and economic facts, has become an established procedure in many nations. One might think that sampling is destined to be superseded by knowledge of the entire population. But whatever may lie in the future, there is no immediate prospect of such a condition. The constant pressure of demands for ever more facts, the limit in money and adequately trained personnel, and the frequent preference for timeliness rather than totality all tend to place emphasis on sampling as a reliable and practicable method of studying social phenomena.

It is not alone the quality and adequacy of samples that has varied. For various reasons the confidence rested in sampling by practical statisticians fluctuated over a wide range. One extreme was reached in the middle of the last century when, under the enthusiasm engendered by Quetelet and his school, a few data often were generalized with no attention

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whatever to the hazards of sampling, and that despite the existence of an adequate theory which might well have served as a check. Another extreme came in the latter half of the same century, when, partly as a reaction from the sampling orgies of the preceding period, and partly under the influence of the widespread censuses, a practicing statistician² specified as fundamental that "the information gathered must be exhaustive." Between these extremes has developed that acceptant yet critical attitude toward sampling which characterizes good statistics.

Our times lie in another swing toward interest and confidence in sampling. This started in the last quarter of the preceding century. Since practical statisticians are now generally aware of the extant theory, we may well look forward to an orderly and fruitful development of the techniques. Despite the fact that most statisticians look upon complete enumeration as the ideal, there is reason to believe that adequate information about most of the social facts in which we are interested may be obtained by relatively economical processes of sampling. It is my object in this paper to survey the accepted theory and to point out some problems for research.

A striking feature of the history of statistics is the meager influence which theory exerted on practice. The theory of probability originating in games of chance and the practice of statistics arising from the necessities of the state have been largely unaware of each other. Only in the last half century has there been any effective union of the two. (Exceptions to be noted are the various applications of the principle of least squares and the development of actuarial statistics.) As late as 1906 Bowley³ chided his colleagues because "In recent years progress in the development of theory has, indeed, been rapid, and a great number of important and thoroughly criticized methods are ready for use, . . . but there has been remarkably little application to practical statistical problems." After three hundred years in which these two aspects

² Pidgin, Charles F., *Practical statistics*. The William E. Smythe Company, Boston (1888).

³ Bowley, A. L., Address to the Economic Science and Statistics Section of the British Association for the Advancement of Science. *Jour. Royal Stat. Soc.* 69: 540. 1906.

of statistics have existed side by side, it is remarkable that in present day writings extensive accounts of samplings are published revealing neither knowledge of nor interest in the pertinent theory which has accumulated. Westergaard⁴ explains this by saying that "Investigations in the Calculus of Probability were mostly of a purely abstract nature. Generally the mathematicians interested in the new science quite dogmatically supposed that experience would harmonize with theory. By their investigations they promoted pure mathematics, but it took a very long time before the calculus of probability came into closer contact with statistics. It may even be asserted that only our own generation has derived full profit from a cooperation of this kind." As Bowley said elsewhere in his presidential address, "I have taken (sampling) at length because the method is so persistently neglected, and even when it is used the test of precision is ignored. We are thus throwing aside a very powerful weapon of research." We have cause for satisfaction that, owing largely to Professor Bowley's own abilities and enthusiasm, we are beginning to make more effective use of this weapon in the social sciences.

When Kiaer⁵ began to use and advocate sampling in the last decade of the 19th century he saw clearly that he must avoid the blunders of the earlier enthusiasts. He characterized his method as *representative*, a term which has since been used both extensively and diversely. While definition is difficult Kiaer's meaning is clear—the sample is spread as a network, rather uniformly though perhaps thinly, over the entire sampled universe. Kiaer's description of his procedure is specific. In every city, streets for enumeration were selected throughout its entire area and houses were visited in regular sequence along each street. In each village three or four houses were taken. In the country, communes were selected from every prefecture and adequately sampled. The essence of Kiaer's representative sampling was large numbers of small units distributed with some uniformity over the region of inquiry. The development of more precise notions of representativeness will be followed in the next section.

⁴ Westergaard, Harold, Contributions to the history of statistics. P. S. King and Son, Ltd., London (1932), page 101. See also, pages 106, 149, and 171.

⁵ Kiaer, A. N., Bulletin de l'Institut International de Statistique, 9: 176. 1895.

From 1900 to 1934

Bowley's work on sampling began near the opening of the twentieth century. By 1925 reawakened interest had increased so largely as to command a section in the program of the International Institute of Statistics. Bowley⁶ and Jensen⁷ were the leading contributors. Bowley's monumental investigation of the mathematical theory of representative sampling has since been improved in only minor details. With two notable exceptions to be discussed below, it may be said that most of our present knowledge of the sampling of social facts is set out in the pages of the 1926 volume of the Journal of the International Institute.

Bowley considered representative sampling as being accomplished by either of two methods, random or purposive selection. There are, it may be added, combinations of the two. I shall endeavor to describe the two methods in some detail, together with their merits and demerits. These two methods constitute Bowley's definition of representative sampling.

In random sampling, every unit of the population has the same chance of being enumerated. This implies that the selection of one unit is independent of that of any other. Furthermore, the method of selection is independent of the characteristic to be examined. Random sampling, therefore, requires the employment of some mechanical device, like a roulette wheel or a set of random numbers, emancipating the selection from the control of the sampler, whether that control be voluntary or involuntary. The result is the kind of sample to which the ordinary theory of uniform probability applies.

The introduction of stratification while slightly modifying the theory by no means impairs it. By this device the sampler is enabled to bring to bear all the information he may have about heterogeneities in the population. In so far as his knowledge goes, he may segregate each homogeneous portion of the aggregate into a separate stratum to which random sampling is then applied. If he is successful he will both im-

⁶ Bowley, A. L., *Bulletin, Institut International de Statistique*, 22: appended to No. 1, Pt. 3, 1926.

⁷ Jensen, Adolph, *Bulletin, Institut International de Statistique*, 22 (1): 355. 1926.

prove his estimate and decrease his sampling error. The penalties for the failure of stratification to be effective are usually not serious.

Purposive sampling involves the preliminary segregation of certain parts of the population and the confinement of the sampling to those parts. The criterion for segregation is that the chosen portion must have the same average as the population in respect of one or more controls. It was assumed that the whole of the segregate should constitute the sample. The idea is that since the controls have averages in the sample which are the same as those in the population, the averages of the investigated variables, assumed to be correlated with the controls, will therefore be better estimated. Although Bowley introduced his description of purposive sampling by saying, "The essential difference is that in purposive sampling the unit is an aggregate such as a whole district, . . . while in random selection the unit is a person or thing . . ." this feature has been shown to be supererogatory. The essential thing is the confinement of the sampling to a portion of the population selected on the basis of the control means.

One advantage claimed for purposive sampling was that it is sometimes possible to carry it through where randomization is not feasible. Another was that the enumeration, assumed to be in selected districts, may be cheaper. The disadvantages are that (i) a considerable knowledge of the population must be available in advance of the sample, (ii) the controls are often not effective, and (iii) the estimate of sampling error rests upon hypotheses which are seldom if ever met in practice.

In discussing the merits of random sampling, two points of view should be distinguished. Neyman⁸ expresses that of probability theory when he remarks, "There is no room for probabilities, for standard errors, etc., where there is no random variation or random sampling." The full play of chance fluctuations is assumed whenever tests of significance are made or limits associated with specified probabilities are set. From the viewpoint of the practicing statistician the advantages of random sampling are (i) its objectivity, (ii) that

⁸ Neyman, Jerzy, On the two different aspects of the representative method: the method of stratified sampling and the method of purposive selection. *Jour. of the Royal Statis. Soc.* 97: 558. 1934.

it can be applied without extensive knowledge of the population, (iii) that it furnishes information about strata if that is unknown, (iv) that it lends itself to stratified sampling if there is sufficient available information about the population, and (v) that the statistical reduction of the results is easy and rapid. The disadvantages are that randomization seems almost impossible in certain cases, and that it may be more expensive on account of the widespread distribution of its units.

In his 1934 paper Dr. Neyman, commenting on the relative merits of these two aspects of representative sampling, remarked that "The two kinds of method (random and purposive) were discussed by A. L. Bowley in his book, in which they are treated as it were on equal terms, as being equally to be recommended. . . . As a result of this discussion it may be that the general confidence that has been placed in purposive selection will be somewhat diminished." Professor Bowley's comment on this was, "I am surprised that he thought . . . that I gave equal importance to that method (purposive sampling, presumably) . . . and to others. Certainly I thought I damned it with very faint praise . . . I agree that it is difficult to formulate, difficult to carry out, and I still think that it is very difficult to get a good estimate of the precision of the result, except in rather unusual cases."

If we add to the foregoing the fact that Professor Bowley never used nor recommended the use of purposive sampling, it is rather clear that his definition of representative sampling reduced in practice to that of stratified random sampling. In effect, then, he reached a position that has been little advanced but only strengthened by later investigators.

It may be appropriate to observe here that a few years ago Professor T. W. Schultz and I set out to locate some townships in Iowa which, having the same means as the entire state for a number of characters, might be used as the basis for purposive sampling. Using assessors' data for 1933, a number of such units were found. However, when the facts for preceding and following years were examined, these township means drifted away from the state values—they could serve in purposive sampling only in the particular year when the sampling was to be made. Since it is practically impossible to sample in the same year that the controls are evaluated, this finding may explain another observation of

Bowley,⁹ "I show that the importance of these controls (in purposive sampling) has been greatly exaggerated."

During the period in which Bowley was advocating random sampling for the social sciences and extending its theory to include stratification, R. A. Fisher¹⁰ was similarly engaged in improving the methods of biological experimentation, exemplifying his work chiefly in field plot techniques. His epoch making discovery of the z distribution together with the associated manner of reducing data known as analysis of variance furnish a method which is available for treating the results of many stratified random samplings.¹¹ This method, quickly adopted in numerous branches of biological research, has received meager attention by investigators of social phenomena. Since the stratified random sample is recognized by mathematical statisticians as the only practical device now available for securing a representative sample from human populations, the use of analysis of variance and its associated tests of significance may be expected to increase rapidly in social researches.

Before taking a look at the next major development in sampling theory, three remarks should perhaps be made about present attitudes. First, there seems to be widespread misinformation about the function of randomness in sampling. One often hears the statement, "I am not interested in a test of significance—it is only the average that I wish to know." The hitch is that from a sample the population mean can never be known but only an estimate of it. How reliable is this estimate? In the absence of complete information about the true mean, one can know only the fiducial probability that such parameter lies within certain limits. But the validity of this probability rests on the assumption of randomness in the sampling. In modern sampling theory, estimates of an average and of its variability are not two separate problems, but are rather two aspects of the same problem of estimation, and there is no theory of estimation for samplings other than random.

⁹ Loc. cit., appendix, page 5.

¹⁰ Fisher, R. A., *Proceedings of the International Mathematical Congress*, Toronto, p. 805, 1924.

¹¹ Snedecor, George W., *Proceedings of the 1938 Ohio Conference of Statisticians*, Ohio State University.

Also, *Statistical Methods*. Collegiate Press, Inc., Ames, Iowa (1938).

Cochran, W. G., *Journal of the American Statistical Association* 34: 492. 1939.

The second remark has to do with uses of the description "representative" in senses different from that set out above. Some writers have designated their samples as representative without advancing evidence that they were either random or purposive. Naturally there is no monopoly on the use of the phrase "representative sample," nor is there evidence that representative samples may not be got in ways other than those we have been discussing. On the other hand, if one employs a technical term in a sense different from that which has been accepted in his field, he should assume two obligations: first to specify precisely his new meaning, and second to prove by the methods available in mathematical statistics that the sampling really is representative.

The third remark is this: one occasionally meets purposive samplings in which the investigator demonstrates the validity of his controls in respect of their means, but to which he makes no effort to apply the appropriate statistical method. The reader, being left in the dark as regards linearity of regression, has no way to judge of the unbiased character of the sample averages; and being uninformed of the sampling error must merely guess at the precision of results. Required to draw his own conclusions, he cannot be blamed if he becomes skeptical of the authoritativeness of the whole report.

The second notable contribution following Bowley's is that of Neyman¹² in which he reexamines the representative method in the light of recent sampling theory. He emphasizes the earlier findings that the controls used in purposive sampling are often ineffective. He finds that if it is to yield unbiased results purposive sampling must ordinarily be designed as a special case of stratified random sampling. He discovers, finally, that the most efficient number of sampling units per stratum is proportional to the product of the number of sampling units in the stratum by their standard deviation. To quote: "The final conclusion which both the theoretical considerations and the above examples suggest is that the only method which can be advised for general use is the method of stratified random sampling. If the conditions of the practical work allow, then the elements of the sampling should be individuals. Otherwise we may sample groups, which, however, should be as small as possible."

¹² Loc. cit.

Thus by the newer theories of mathematical statistics Neyman reached the conclusion which actually guided Bowley in his samplings. In the light of present knowledge the term representative sample must be limited in practice to either a random sample or a stratified random sample. The reader who is interested in the technical details will find them discussed in Neyman's article.

May I interpolate a fact about random sampling which seems to have been rather extensively overlooked. The units may be drawn from the population either with or without replacement, this being true whether the population is finite or infinite in extent. That is, in a sample drawn by either procedure every sampling unit has the same chance of being included.

Looking Forward

As has been indicated, much research is to be done in devising new sampling techniques and in learning how to apply those already known. I am aware of only one new device proposed in the last five years, that of double sampling. This was a suggestion of the Consumption Research Staff, Industrial Section, of the National Resources Committee.¹³ The mathematical background has been set up by Neyman¹⁴ so that this interesting method of conducting stratified random sampling is ready for application. There may be many such modifications awaiting discovery by ingenious samplers.

Another area for investigation is methods of attaining randomness in sampling. A problem of this kind attacked by Mr. Jessen is reported elsewhere in this number of the Journal. Much research is necessary before known theory can be applied to the more difficult situations.

What relaxation in the conditions of random sampling can be attempted without risking too much loss of efficiency? This question is being explored by Dr. Charles F. Sarle and Mr. Arnold J. King of the Agricultural Marketing Service, U.S.D.A. In estimating the yields of crops there seems to be no feasible way of attaining strictly random sampling. It is indicated, however, that if a grid of sampled farms is laid down over the entire region, with random selection of the

¹³ Journal of the American Statistical Association, 31: 135, 1936. Also, 32: 311, 1937.

¹⁴ Neyman, J. Journal of the American Statistical Association, 33: 101, 1938.

sampling unit in each farm, little loss of information is incurred. Much of this kind of experience must needs be acquired.

In the social sciences the problem of sampling has one complication usually absent in biological experimentation—the necessity of expanding the sample mean to an estimate of a population total. The expansion factor, taken from some available sources, may itself have an appreciable sampling error. Furthermore, it is difficult to arrive at compatibility between the sample and expansion data—the two are usually taken by different people at different times and with different definitions of terms. As sampling techniques improve, the need for uniform practices will increase.

What is the future of sampling in contrast with the census? The disabilities of the census all flow from its cost. If resources were unlimited a complete and correct enumeration could be made in a day by trained enumerators, with the tabulated results promptly available. Not only could it be duplicated as often as desired, but enumerated facts could be extended *ad libitum*. If such results were the chief end of society the census would be unchallenged.

From the viewpoint of value the sample appears to better advantage. I might even support with some plausibility the radical proposition that a census is never worth what it costs in time, effort and money. I shall not attempt it. But we may well consider whether it is wise to essay in any one period an exact determination of such fluctuating quantities as income, population and production. The query is emphasized by the fallibility of the results, flowing not only from the difficulties of the enumerator, but even more from the inability of the enumeratee to give correct information. It seems to me quite probable that the same resources could be utilized more efficiently in sampling. An adequate corps of enumerators might be trained to sample the population frequently for timely information. The intensity of sampling could be adjusted to the stability of the character sampled as well as to the desired precision of the results. Ways could be devised for reducing to practicable levels the error in statements by the person interviewed. This is a field of research which is ripe for harvest.

AN EXPERIMENT IN THE DESIGN OF AGRICULTURAL SURVEYS¹

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A DEPARTURE in agricultural fact-finding was made last winter (1938-39), when the Bureau of Agricultural Economics, in cooperation with the Iowa State College, sponsored an agricultural survey covering 773 Iowa farms. The purpose of the survey was not the usual one of attempting to find just so many agricultural facts but to obtain those facts in such a way that more efficient future surveys could be planned. Hence, it was an experiment in survey design.

What do we mean by survey design? To use an illustration we propose to determine the net income of Iowa farmers by means of personal interviews with farmers. We are allotted a given sum of money with which to conduct this survey. Naturally with the money allotted us we want to get the best possible estimate of this net income. How shall we conduct this survey in order to obtain the best possible estimate? Shall we interview a few farmers in each county of the State or shall we select a few counties and interview a corresponding greater number of farmers within each of these? How shall we select these counties? How shall we select the farmers to be interviewed? Each decision we make concerning such questions as these determines a design. Our problem is to determine that design which shall best suit our needs.

The Iowa Survey

The State of Iowa has 99 counties. Since two of these are unusually large, each was divided in two for purposes of this survey, thus giving a total of 101 areas of approximately equal size. These 101 areas were the strata constituting the geographic universe from which the sample farms were

¹ Journal Paper No. J685 of the Iowa Agricultural Experiment Station, Ames, Iowa Project No. 611.

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² For statistical advice the author is indebted to Professor G. W. Snedecor, Dr. C. P. Winsor and Professor W. G. Cochran, all members of the staff at Iowa State College.

drawn. The typical Iowa county is composed of 16 surveyed townships, each of which contains 36 sections. A section is a block one-mile-square, or 640 acres, and in Iowa it contains on the average the farmsteads of 4 farms. This, then, is the geographical structure of Iowa's agricultural universe.

Following accepted sampling theory, it was decided that every effort should be made to insure the random selection of farms in order to guard against any bias which is likely to occur if the selection is left to the enumerator.³ Therefore, to insure that each farm in the State would have an equal chance of being included, regardless of its size or position, the following plan was adopted. Geographical units such as sections can be easily selected by a system of random numbers. Hence a geographic unit provides a convenient unit of sampling. By selecting sections at random and enumerating all farms that have their farmsteads situated within those sections, an unbiased selection of farms is assured and enumerators are denied the privilege of selecting farms which they believe ought to be included. In the Iowa survey it was thought advisable to use as a sampling unit only a quarter of a section in order to have smaller groups of farms and more of them. Selection was made as follows: With the aid of county maps, for a typical county, 7 townships were selected at random and from each of these a quarter-section also was selected at random.⁴ From these townships 2 were selected at random and another quarter section was selected from each, making a total of 2 quarter-sections each for two townships and one each for the remaining 5. Selections were made in this way in order to provide data for an estimate of the variation of quarter-sections within townships.

To provide for proper weighting because of variations in county sizes, it was necessary to make the number of quarter-sections selected per county proportional to the number of acres in farms in that county. If a selected quarter-section chanced to be in a lake, city, or some such non-agricultural

³ Several studies have been made on similar kinds of biases. See: Cochran, W. G. and D. J. Watson, An experiment on observer's bias in the selection of shoot-heights. *Empire Journal Exper. Agric.* 4 (13): 69-76. Jan., 1936.

Yates, F. Some examples of biased sampling, *Annals of Eugenics*, 1935.

⁴ Random selections were conveniently and quickly accomplished by using a table of random numbers.

region, a re-selection was made. If, however, the quarter-section chanced to be one upon which no farmsteads were situated it was held to be a valid selection although there was nothing to enumerate. Maps showing the location of farm buildings are available for most of the counties in Iowa. These were consulted after selections had been made and the quarter-sections which were indicated thereon as having no

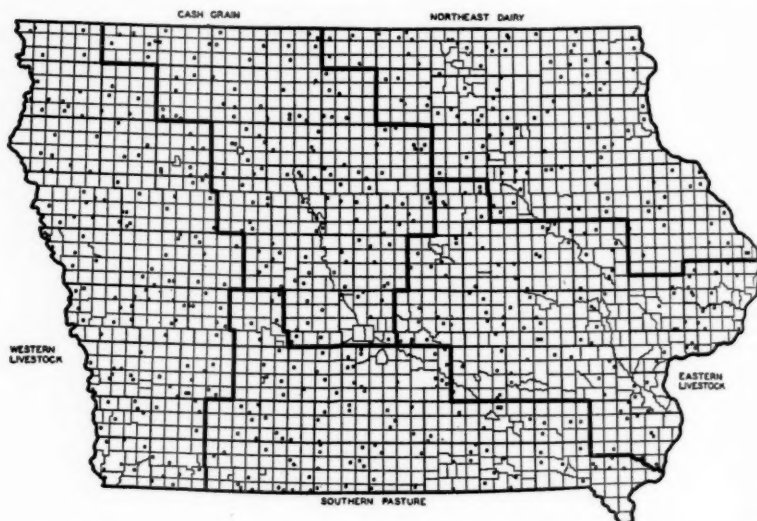


FIG. 1. Map of Iowa showing the location of quarter-sections chosen for enumeration in the survey. Of the 907 quarter-sections selected, 635 contained farmsteads (these are the quarter-sections shown on map). Situated on these were 791 farms from 773 of which records were obtained. Total number of farms in Iowa according to the 1938 Assessor's report is 209,709. The broad lines indicate the outlines of the type-of-farming areas, divisions which were useful in the analysis. Civil rather than the U. S. townships (which were used in the selection of sample) are shown on the map. In Iowa they are nearly identical.

farmsteads on them were marked on the enumerator's field maps in order to prevent unnecessary travel. Since 30 per cent of the quarter-sections had no farmsteads, a considerable saving resulted whenever these quarter-sections could be detected before the enumerator went into the field.

The map in figure 1 shows the location of the quarter-sections that had farmsteads and that were enumerated during the survey. Variations in the number per county are not only due to differences in average farm size and amount of farm

land in county but also to chance. We believe, however, the quarter-sections selected are without bias and hence present no serious statistical difficulties.

Instructions to Enumerators

Each enumerator was given maps showing the quarter-sections to be visited. If he found that a farmstead had been abandoned, this information was recorded. If a farmer was not at home or refused to give information, the enumerator was instructed to select the nearest farm as a substitute. (This relaxation from strict sampling discipline was made almost necessary because of cost considerations. Unless rigidly controlled, however, such procedure may become a dangerous source of bias.)

The enumerators, who were college seniors and graduates, made the survey during their Christmas vacation. They experienced little difficulty in locating the selected farms and found that less than 5 per cent of the farmers refused to give information.

Schedules included a variety of questions on acreages in crops, yields, income, and expense items. In addition some questions on farm population and standard of living were included.

The Analysis

For the basic statistics, analysis followed conventional procedure for analysis of variance.⁵ Essentially the problem is one of determining how farm-item variability is distributed geographically. It would be desirable to know, for instance, with respect to a certain item, whether farms within the same township, say, vary more than farms in different townships. If this is true, then to sample this item it would pay to spend a considerable time taking schedules within a few townships, for if townships are very much alike then relatively few need be visited. If farms in the same township, however, are more

⁵ Fisher, R. A., *Statistical methods for research workers*. London, 1936. Snedecor, G. W., *Statistical methods*. Ames, 1937.

Some of the methods of estimating efficiencies if other sampling procedures were followed were obtained from Professor W. G. Cochran, now a member of the staff at Iowa State College. No attempt will be made to show those methods in this paper. See his article, *The use of analysis of variance in enumeration by sampling*, Jour. Amer. Stat. Assoc. 34: 492-510, 1939.

alike than farms in different townships, that is, if there is a big difference between townships, then a different sampling procedure is advisable. Taking a lot of schedules within a township would be a waste of time and money. The big differences would be between townships and therefore an efficient sample would include a number of townships with relatively few farms in each. The statistical analysis of the data from this survey involved the measurement of such geographical variability and its consequent effect on sample design.

The Results

Although Iowa is generally considered to be a rather homogeneous agricultural area, for purposes of sampling agricultural facts it was found that it may be wise not always to be guided by this opinion. Statistical analyses indicate that for some farm characteristics this opinion is somewhat true, for others the contrary is quite evident.

The following table shows the variance within the indicated divisions for cattle, for corn yields, and the average for 13 items, expressed as percentages of the variance within the State. It will be seen that about 60 per cent of corn yield variance is associated with differences in location between farms, whereas only about 25 per cent of cattle variance is associated with location.

TABLE 1. VARIANCES WITHIN DIVISIONS EXPRESSED AS PERCENTAGES OF VARIANCE WITHIN THE STATE

Item	State	Type-of-farming area	County	Township	Quarter-section
Number of cattle	100	100	96	88	76
Corn yield	100	74	70	50	41
Average (for 13 items)	100	94	90	75	61

In almost all cases there were large differences between the type-of-farming areas. County differences within these areas, however, usually were not great. The great amount of heterogeneity seemed to be within the county, occurring either within or between townships.

Listed below is a sample of items that have either one or the other of these variability patterns:

Group I

Items having *high* within as compared with between⁶ township variability
(Per farm)

1. Number of sheep
2. Number of cows milked in 1938
3. Number of gals. milked yesterday
4. Receipts for dairy products, 1938
5. Acres in corn
6. Acres in oats
7. Bushels of sealed corn

Group II

Items having *low* within as compared with between⁶ township variability
(Per farm)

1. Dollars feed purchased, 1938
2. Gross expense
3. Gross income
4. Net income

This seems to indicate that there is something of a township or community pattern wherein, for the items listed above, there is some degree of differentiation in the farming practices, but that the fortunes of the members of the township group, in spite of this internal adaptability, rise and fall somewhat together.

What this means to the sampler is this: If it is income or aggregate farm business that is to be sampled, it seems that it would be better to visit as many townships as possible, taking few farms within each. To study farm organization, however, it seems that in general more effort could be directed toward enumerating heavily within a few townships. It must be remembered that there are differences in townships and therefore some effort should be made toward including in the sample a suitable number of them compatible with both the variability pattern and costs. The above statements suggest only where the emphasis should be placed. The exact proportions of these allocations, which is something more, can be determined once these variances and costs are known.

Evidence of Assessor Bias

In table 2, farm means for livestock inventories as of January 1, 1939 are compiled from three sources: (1) this survey, (2) Iowa assessor statistics and (3) estimates by the Bureau

⁶ Between township mean square within counties.

of Agricultural Economics. The estimates of the Bureau and the totals of the Assessor were reduced to a per-farm basis, assuming a total of 209,709 farms as given by the Assessor reports.⁷

TABLE 2. MEAN NUMBER OF LIVESTOCK PER FARM DERIVED FROM THREE SOURCES: (1) SURVEY, (2) ASSESSOR AND (3) B.A.E.

Area	Swine		Cattle		Horses		Sheep		Chickens	
	Sur-vey	Asses-sor	Sur-vey	Asses-sor	Sur-vey	Asses-sor	Sur-vey	Asses-sor	Sur-vey	Asses-sor
C.G.	41.3	32.8	21.1	19.2	4.1	3.6	8.3	5.3	184.2	
E.L.	45.5	38.4	24.3	20.1	3.8	3.3	5.2	5.3	142.2	
S.P.	26.8	19.8	18.5	14.2	3.8	3.1	14.7	12.0	117.7	
W.L.	40.3	33.7	22.4	19.6	4.1	3.6	3.4	4.0	143.0	
N.E.	36.2	29.2	24.7	21.9	4.2	3.7	3.0	3.3	156.4	
State	38.3	31.1	22.2	19.1	4.0	3.5	6.8	5.9	149.0	*
B.A.E.†		39.0		21.3		3.7		8.2		14.39
(Standard error)‡		(1.47)		(0.81)		(0.12)		(0.98)		(3.34)

* Not obtained by the assessor.

† Reported as a State total only.

‡ Standard errors as calculated from survey data.

Except for sheep, the discrepancies between the figures of the Assessor and those obtained in the survey are significant; that is, they cannot be easily explained by sampling error. This evidence, together with the results of other studies⁸ indicates that a sample may give even better results than complete enumeration if, in order that the complete enumeration can be obtained, it is necessary to employ an agency that for reasons beyond its control may provoke biased answers to questions. For this reason statistics gathered by a taxing agency are subject to a "taxation bias" and despite "complete" enumeration may not give as good results as a small sample taken by some agency less subject to bias.

This problem, which is not encountered in biological sampling, is certainly important here. It may well be true that those collecting social data—that is, data taken by interview—have been wasting much good effort in attempting to get a lot of data in order to minimize sampling error, when a small, carefully selected and carefully enumerated sample

⁷ Annual Farm Census, Iowa and Federal Division of Agricultural Statistics, 1938.

⁸ Norman V. Strand in an unpublished study found that farmers report less livestock to assessors than on the B.A.E. questionnaires.

would be far better. Certainly the Iowa survey would indicate this.

We also conclude from table 2 that the mailed questionnaire type of survey, such as the B.A.E. employs, seems quite effective in estimating livestock numbers.

Conclusions

(1) To be efficient, an agricultural survey design must have as much geographical distribution as is compatible with costs. As has been indicated, it may be wise to sample farms in groups because (a) this may be a convenient way of making random selections, (b) the loss in sampling efficiency will be more than offset by the decreased cost of enumeration, and (c) perhaps better enumeration can be obtained because the concentration of enumeration areas would permit of better control over field work. This last point might have great importance if schedules are complicated or if enumerators are untrained. Too, it permits the enumerator to re-visit "not-at-home farmers" without involving excessive costs. Samples to be truly representative must not exclude any group of individuals that may differ from those included. If "not-at-home farmers" are at all different than those who are at home, then we must make every attempt to minimize their importance. A good way to do that is to design the survey so that these farmers can be interviewed when they are at home.

(2) Until we know more about the agricultural population it seems that about the only feasible criteria for stratification are geographical. Studies are under way to find other criteria such as tenure, type-of-farm, and size-of-farm, and the effectiveness of each, but little is known about these at this time.

(3) Survey design is based essentially on two considerations (a) the statistical nature of the item or items of inquiry, and (b) the cost of obtaining the information. Practical consideration of cost may reduce sampling efficiency but the over-all efficiency of the survey is what counts. This may vary widely according to the object of the inquiry. An omnibus type of survey will need to be a compromise design at best.

MEASURES NEEDED TO ACHIEVE CONSERVATION AND EFFICIENT PRODUCTION¹

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INTEREST in conservation of natural resources has been developing along a wide front. Nevertheless it still is of more interest to city editors, government workers, politicians and farmers who are now conserving their resources than to the owners of natural resources in need of conservation. Thus far, most of the positive social action intended to increase conservation has been de luxe demonstrations on the part of governmental personnel, technically trained in the sciences brought to bear on this problem, or cash payments by the government for uses of land less exploitative than would otherwise prevail. The underlying assumptions, largely correct, have been that lack of knowledge of improved farming practices and economic pressures are the two major causes of uneconomic exploitation of our soil resources. A few of our people who have thought more deeply into the subject see these two factors as the immediate ones, but back of them they see a system of direct and indirect social controls of land use and attitudes toward land built up through the pioneer days which are quite inadequate for the present or the near future. The standard soil conservation districts act formulated in the Department of Agriculture and now passed in substantially the standard form by a large number of state legislatures is the most notable development as a result of this line of thought. Little progress has been made, however, in the development of new social controls under this enabling legislation.

Elementary economic analysis indicates that as our virgin resources become more nearly depleted and our supply of capital goods grows, the probability is increased that additional resources used for conservation will be in the interest of general welfare.^{1a} Furthermore, cultural and institutional lags keep investments in

¹ This paper has been prepared for the Annual Meeting to be held in Philadelphia.

^{1a} "Measures needed" which appears in the title of this paper I assume to mean governmental measures or social controls which if adopted would increase general welfare. I am concerned with the economic level of conservation of agricultural land. Hence conservation is achieved when the marginal return of a unit of a factor of production invested in the maintenance of agricultural land equals marginal returns from the best alternative uses.

conservation from advancing as rapidly as economic conditions justify. Hence, a broad program of research and education designed to keep the owners of the resources up-to-date on the economic opportunities of investment in conservation must always be an important part of governmental activity in this field. There is nothing new in this observation, but much work still needs to be done in the development of an effective educational program. Far too large a part of the activity in the field of conservation at present is based on maintaining prestige by the various governmental agencies. Another source of weakness is that programs too often are developed by technically competent scientists who lack the ability of an educator. The idea of measuring the effectiveness of alternative educational and demonstrational techniques has not as yet found favor. In this field the need of the hour is something akin to the studies of the Central Statistical Board or the efficiency studies of the Brookings Institute to measure the effectiveness of various types of "action," educational and demonstrational programs. Major reinforcements in the factual content of a number of phases of the educational programs dealing with conservation are also needed.

In addition to the education on what the individual may profitably do in the way of conservation under existing institutional arrangements we also need a mild overhauling of our property rights in natural resources. If we are going to have our natural resources privately owned and yet have them conserved, a closing of the gap, where one exists, between group and individual interests is imperative. The existing enabling legislation is available in many states for farmers to organize into local districts for such action. But, as pointed out above, it is not being used except in a few instances. The most powerful motive for conserving or exploiting resources is the economic one. Hence, if property rights (statutory regulations) were such that individual and group economic interests were identical insofar as is possible, the most important motive for conserving the soil would be harnessed. Changes in property rights take place slowly. There is need for additional study by our social engineers to determine whether progress can be made most rapidly by local group action or by some larger unit of government in bringing our property rights up to date. Those phases of the problem of conservation affected with public interest must eventually be handled by regulatory measures. The earlier we get to

work on a study of where individual and social economic levels of conservation differ and why, the sooner facts will be available on which public opinion will be crystallized into demands for desirable revisions in our statutory regulations.² At the present writing, to one who is most familiar with Corn Belt conditions, divergence between the individual and socially desirable level of conservation of agricultural land appears to be most serious in the Great Plains and the Cotton Belt.

The landlord's economic interest in conservation is identical with that of the owner operator. Uneconomic exploitation will affect his future income from a given farm just as surely as it would if he operated it himself. But lack of understanding of his own economic interests and a far too general indifference to the responsibilities attached to land ownership by the absentee land owner has been an important factor in the exploitation of rented land. Among the many alternative ways of dealing with this problem one stands out as particularly promising. It is the English system of compensating tenants for unexhausted improvements made during their tenure when they leave a farm. An integral part of this system also is the compensation of landlords for damage done by tenants. Such a system would give tenants an economic motive they now lack for making investments in soil conservation. And until we make more progress toward financial stability additional measures are needed to give the mortgage holder an opportunity to safeguard his equity in the land as soon as the title holder gives up hope of retaining or selling it.

In considering measures needed to achieve conservation, care should be taken to distinguish between conservation and rebuilding of resources. Much of our present governmental activity under the name of conservation is far more than public investments for farm resource maintenance. They are investments in resource rebuilding. There is no more general welfare justification for a broad and indiscriminate governmental program of rebuilding agricultural land than for rebuilding harness and buggy factories. Unless the present war brings new demands for agricultural land at the present unforeseen, the use of our entire supply of land under competitive conditions will apparently lead to the demoralization of the market for agricultural products. The technology of soil conservation is

² Although not considered here, it is possible to conceive of conservation of certain resources being socially desirable even though uneconomic.

such that resources can be maintained at their present level without rebuilding them. It is only where soil resource rebuilding is a necessary part of the rehabilitation of the farm family that the use of government funds for rebuilding depleted soils may be justified.

Conservation of soil resources also is indirectly affected by the way our entire research resources are utilized. By far the greater part of our governmentally subsidized research and educational plant in technical agriculture is and has been directed toward improving the growing and utilization of grain and fibers. This disproportionate investment of government funds over a period of years has been a powerful factor in establishing the present comparative advantage in using our agricultural land for cultivated crops. Reflect for a moment on the economic opportunities of using more grass and legumes in the cropping system if as much improvement had been made in their yielding ability, disease control, in methods of feeding them and in farm machinery for handling them as has been the case for corn, small grain and cotton and tobacco in the last 38 years. The pendulum has only recently started to swing back: may its movement be continued.

I come now to the measures needed for efficient production.³ Increased demands growing directly or indirectly out of the European war which started September first have changed the situation only moderately. Technological research subsidized by various units of government and by private capital has been so successful that one can almost say there has been a continually increasing economic motive for entrepreneurs to make greater and greater capital investments in agriculture. The decade of the twenties is noteworthy both for the persistent demands for farm relief because of sub parity prices and for the tremendous increase in the capital investment in agriculture. These capital investments replaced both labor and horsepower. They were not a simple replacement, however, but had additional important technological and economic consequences. The new power equipment although it decreased unit costs in most cases decreased the market for the products of the land and at the same time increased cash expenses in farming. These new power units and related equipment made it possible to expand wheat acreages into new areas and increase

³ Production is being carried on efficiently when no rearrangement of the factors will lower unit cost.

the acreage of cultivated crops such as soybeans in the heart of the Corn Belt. The development of specialized equipment, such as commercial hatcheries in the case of poultry, has enabled the output of many minor agricultural products to be increased greatly.

The introduction of agronomic improvements in the form of hybrid corn and high yielding legumes such as alfalfa and sweet clover have increased markedly the output of the typical Corn Belt farm during a period of time when even the urban people recognized that agricultural output was already excessive.⁴ General welfare can be increased under such conditions only where there is an expanding market for the added output or when there is opportunity for the high cost sector of the industry (population and other resources) to shift into other industries.

Efficiency in the use of resources is but one factor in general welfare. In recent years we have had unemployed resources, particularly unemployed labor. Economic analysis as contrasted with political expediency indicates no basis for the adoption of far reaching measures to increase the efficiency of agriculture at a time when there are unemployed men and factories. Increased efficiency in agriculture results in either increased product and sharply lower prices or the displacement of a part of the existing agricultural plant. The existence of unemployed factors of production (in any quantity) is *prima facie* evidence of the inability of the economic system to make the necessary adjustments to get into balance again. Under such conditions governmentally sponsored technological changes increasing the efficiency of agricultural production tend to intensify the maladjustments between the various parts of the entire economy. With a comparatively inelastic demand for the product and absence of opportunities for factors to shift out of agriculture the entire gain from any increase in efficiency and something in addition must go to the purchasers of the product.

The time has come for a careful appraisal of our heterogeneous governmental agricultural program which has grown first in one direction and then in another to meet the popular demands of various interest groups both within and without agriculture. There is no conflict between the older position that general welfare in a competitive economy was increased by greater efficiency

⁴ Dowell and Jesness, Economic aspect of hybrid corn and R. L. Mighell, Economic aspects of hybrid corn further considered. 21 (2) (3) *THIS JOURNAL*

in production and the position I take that increased efficiency may reduce general welfare at least temporarily in a partially employed economy. What should be the criteria used in formulating an agricultural policy in periods of industrial unemployment?

Obviously measures adopted should do two things. First they should increase the welfare of the smaller groups for which they are designed. Second they should increase the economic welfare or at least not decrease it for the economy as a whole. Hence measures designed to alleviate the agricultural sector of an economy in times of unemployment should merely keep the farmers from bearing more than their share of the burden of maintaining but not utilizing unemployed labor and other resources.

Smaller groups within agriculture may require more help. Measures designed to increase their efficiency in production may be justified on the basis of their particular plight, the prospect of increased demand for their product and the shiftability of the specific factors employed in that part of the industry. These conditions are most likely to be fulfilled in the case of the production of relatively new products.

A desirable governmental policy for maintaining efficiency in agricultural production in periods of unemployment should include adequate consideration of the fact that such a situation will not continue indefinitely. In their research and educational programs governmental agencies have trained many scientists whose efforts after years of specialization would be of little value except in their particular fields. This organization would contribute most to economic welfare if during such periods their efforts were directed toward the solution of problems encountered by the present least efficient (and lowest income) sectors of agriculture.

Human nature and social institutions have operated to encourage the development of the applied sciences for the solution of problems encountered by the more aggressive and efficient producers. Our entire educational system and especially our adult educational work in agriculture tends to be of the greatest help to those already possessing the greatest initiative, intelligence and wealth. The standard method for the introduction of more efficient techniques in production is through their adoption by the most progressive farmers with the infiltration proceeding from them throughout the community. A reversal of this procedure would keep our technical staffs fully employed and their contribution to general welfare

during periods of industrial unemployment would be much greater than it now is.

As we become more experienced in our governmental agricultural adjustment program and more conscious of our consumer needs the economic soundness of specific production control programs is increasingly questioned. Excellent participation in the AAA program in Iowa this year resulted in a reduction of total feed units available (with normal yields) of less than 4 per cent. Probably even less of a reduction was obtained in the other North Central States. There was, of course, some slight gain in the reduction of soil losses from growing fewer intertilled crops. Production adjustments, however, which were often although not always less efficient than the usual practices, were probably ineffective in influencing the volume of livestock production. Our experience with the adjustment program in the Corn Belt indicates that at several points compliance with the regulations introduces inefficiencies in the use of resources. Consider for a moment the split fields, the confusing crop classification, the detailed measurements and the many regulations that are a part of the present program. The economic effect so far as market supplies of livestock are concerned would not be far different and the forced diseconomies absent if we confined our restrictions to requirements for meeting good soil management and farming practice standards.

If full employment results from the demands of the European war a new situation will confront the agricultural policy makers. Under such conditions if efficient use of resources is their goal, every effort should be made to open channels for the movement of the excess farm population into industry. A fully employed industrial population and increased demand for agricultural products resulting directly or indirectly from the European war would not change the basic problems of agriculture but their solution might be greatly facilitated. The two things the agricultural sector of our economy needs and has a right to expect of the government are increased control over the individual's use of land to prevent anti-social uses and increased governmental assistance in bearing the relocation cost of families driven out of agriculture by the competitive introduction of more efficient production techniques.

PERMANENT ASPECTS OF SUPPLY AND PRICE ADJUSTMENT IN AGRICULTURE¹

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IT IS customary to begin on a problem such as mine with a brief reference to the difficulty of the task. I think I have a case. I am to assess the need for continuing measures of control over output and price in the agricultural industry. This must be done for a future which, as always, is unknown and which seems at the moment to offer an unusually large and exceptionally disagreeable range of possibilities. A further step is to formulate the lines of action which would best fit the complex pattern of American agriculture and likewise the complex machinery which we have developed to adjust the agricultural industry. However, I am going to stop short of this latter task. The first part is a sufficiently large order.

There are only two groups of people who can talk with complete safety about the future—those who have divine guidance and those who state precisely what they assume the future to be like. While unfortunately I do not belong to the first group, I am not going to follow exactly the rules of safe conduct for the second. I propose in this paper to set out or classify the various factors which bear upon the need for continuing control of agricultural prices and output. Then from the probable behavior of these various factors which bear upon the problem and the several alternatives, I hope to suggest some answers to the problem itself. That problem, to repeat, is whether it will be necessary as a permanent policy to exercise control over output and prices in the agricultural industry.

The Elements of the Problem

There are many things which bear upon the future of agriculture and what may loosely be called the need for supply and price adjustment. Of these, I think four stand out as follows:

1. The ruling level of the national income; or, in other words, the state of domestic industrial and commercial prosperity and employment.
2. The effective foreign demand for American farm products.

¹ This paper has been prepared for the Annual Meeting to be held in Philadelphia.

3. The level of real income which the farm community and its leaders deem adequate. To this might also be appended some reference to the effectiveness of the political machinery by which the farm community translates its demands into action.
4. The possibility of permanent structural differences between agriculture and other industry which operate to the relative disadvantage of the farm producer.

It will be necessary in discussing these four factors in the problem to deal with them in general terms, and among other things, to speak of the agricultural industry as a whole. There is only one excuse for this—my topic itself is general. However one feels about it, one must give broad answers to a broad question.

Throughout the paper I assume that the basic reason for supply and price adjustment in agriculture is to increase farm income. In recent years there has been a good deal of talk about stable prices and planned production as an aid to socially desirable soil conserving and soil building practices and the control of run-off and erosion. One of these days production and price control will emerge, no doubt, as a factor in national defense. While some of this discussion is meant to be taken seriously, the major purpose of the farm programs in past years and in all certainty, in future years, will be to affect the current income of farmers. Much of the rest is window-dressing.

While I am not dealing with the detailed *modus operandi* of increasing farm incomes, I do assume that it takes the general form of past years. In other words, it centers upon control of the total production of agricultural commodities. In the short run this may involve price fixing, either directly or through loan programs, or relief buying or price parity payments. But long run dependence is upon the power of the government to control and restrict the supply of the commodity with the assumption, at least, that demand is of less than unit elasticity. It is something of this sort which, I believe, we are coming to accept as standard in farm policy in the United States.

1. National Income

The first factor which bears on the continuing need for measures of farm price and production adjustment is the continuing level of income in the economy as a whole. Except to stress the importance of this element in the problem, I am not going to deal

with it at length for it comes up in another part of this discussion. The higher the level of income production in the economy the less farm production control and price enhancement we are likely to have. The effect of a high level of industrial prosperity on agriculture is twofold:—it means a higher level of demand for agricultural products and, though not so important, it means less competition among factors, particularly labor, for employment in agriculture.

The future level of national income is, of course, something which no one can predict. In such cases the usual practice is to assume that the future will be like the present. (In a preliminary draft of this paper I adopted this convention in another connection and assumed that the then present state of armed peace would continue.) However, I think we can expect something better in the future than the 60 to 70 billions of income to which we have become accustomed in recent years and the 6 to 10 million unemployed which accompany it. I may over-emphasize the importance of intellectual solutions, but it is certain that we have come a long way since the beginning of the depression toward an understanding of the things which determine the level of income production in the economy. Likewise we are farther along than anyone would have guessed five years ago in making economic law the hand-maiden of economic welfare. With both the end and the means becoming clear, I feel fairly confident in assuming a substantially higher level of income production than we have had during the past decade. With this assumption, I leave further discussion of the matter for the next paper.

2. *Foreign Demand*

Under conditions which until a short time ago were still called peace, it was possible to say something fairly definite about foreign demand. One could say that so long as that uneasy peace lasted, foreign demand while it might grow worse, in all probability would not improve. Economic nationalism was the agricultural adjustment of farmers in other countries; and even where the old custom of holding elections has been abolished, farmers still retain political strength. The war—this war—is still too new for even a *a priori* judgment of its effect on American agriculture. Nor can one reason by analogy from the experience during the first world war for many things have changed since then. The first war came to an international economic system—an international system to which

all the belligerent powers belonged in 1914. It was partly the heavy tribute which these powers had to pay to American agriculture during the last war, or the adjustments and costs which came with sudden severance from the United States, which caused them to withdraw in part from world markets. So far as these efforts were successful, the impact of war demand will be less during this war than during the last.

There are a number of other factors which work in the same direction. World stocks of commodities are much larger, as the Department of Agriculture took pains to point out almost before the first shot was fired. At the moment of writing, the lower Danube and Balkan countries, with their grain areas, are still neutral. More important, perhaps, the distribution of international purchasing power is different from what it was in 1914, and it is to be recalled also that in the last war the French and British governments were permitted to borrow heavily in New York to buy American materials. Just as the peace was a different kind of peace, so we can expect the war to be a different kind of war. My own guess is that it will expand the foreign demand for farm products, with the possible major exception of cotton,^{1a} and that it will expand it much less than most people expect.

To go beyond the war in appraising the foreign demand for American farm products is indeed a ticklish business. I have only one suggestion. The war will extend and tighten the controls which all governments apply to their economic life; there will be still more regimentation than before. In the past this has always meant, as it will mean during this war, increased protection of the domestic food supply and increased encouragement to domestic agricultural production. It is possible that the trend may be reversed during the next peace, but if it is, the change will be much more radical, nay revolutionary, than had it come with the last peace. In short, for the long pull one must reckon with either revolutionary change in international organization or more protection for agriculture than before.

3. The Scale of the Income Demands of the Farm Community

It is clear, I think, that the amount of income which the farm

^{1a} It is even dangerous to reason about cotton by analogy to the last war. Trade routes which were open during the last war may be closed this time and the supply of shipping, a determining factor before, may prove to be quite different.

community demands, or is satisfied with, is of first importance in determining the extent of the controls which it will be necessary to apply and the price support which it will be necessary to give to the agricultural industry. This is another difficult item to deal with. As economists we are accustomed to think of agricultural income as determined by economic law; the idea that it is determined in part by the demands of the industry itself is still somewhat novel, and for that reason alone it is difficult to handle. We have passed from a question of economics to a question of political economy and most of us were trained as economists.

The question of what farm income should be taken as the goal or *norm* of agricultural policy and specifically of production control measures has, to be sure, been a keenly debated question ever since 1933. The original AAA Act established pre-war relationships as those which yielded the income which the farmer might reasonably expect, and by inference, might be satisfied with. At each of the meetings of this Association which I have attended since, someone has talked about parity prices and explained that he did not believe in them; nowhere on the record can I find an economist who defended the parity notion except as an expedient. Yet there has been a general reluctance to propose alternative income norms to define the level of farm income to which we should gear farm policy. Also there has been unwillingness to support those, like cost of production and cost of production plus, which farm groups have advanced.

Although the question of the level of farm income which is sought as the standard or goal is a vital element in my problem, I am also one of those without a solution. At times I have been inclined to think that the use of an historical base period may not be such a bad plan. Certainly we have talked an enormous amount of rot about applying brakes to the wheels of progress whenever we begin to look at things as they used to be. The fact that farmers generally regarded their income situation in the pre-war period as satisfactory is in itself of certain significance; the goal or norm for agricultural income will have to be one which the farmers consider satisfactory. The real difficulty is that the base is technologically obsolete and that it may also be obsolete, or quickly become so, with respect to the farmers' notions of a fit return. This element of my problem I quite frankly propose to leave as an unsolved riddle.

4. *Structural Peculiarities of Agriculture*

The final element in the problem is in some ways more fundamental than any of the others. The question here is whether agriculture, by the nature of its organization, tends to be placed in a position of disadvantage in the modern economic system. Are there, in other words, structural peculiarities associated with the agricultural industry which make it especially difficult for agriculture to compete on an even footing in the modern industrial world? Is there a basic economic explanation for the special measures of support to agricultural prices and incomes which have been adopted in recent times not only by the United States but by every other western country without exception?

The answer to these questions involves a resort to the theory of agricultural economics and, while this requires no apology, it does require some comment. As agricultural economists we have always been exceedingly self-conscious about theoretical generalization. Except for some over-refined and not very useful work on production functions and some less refined but more utilitarian work on agricultural prices, we have not so far made much progress. We are handicapped in the field of agricultural economics by the absence of a body of theory; and, by the same token, it is necessary to proceed with great caution in dealing with problems which can only be tackled by such means.

The assumptions as to competitive organization with which, explicitly or implicitly, we have always approached the agricultural industry do not require any basic revision. We have assumed in the past that agriculture is characterized by atomistic units and that no one of these units is in a position to affect substantially the market in which it sells its product or the market in which it buys its factors of production. For the great body of agricultural production, ex-AAA, this assumption is valid today.

However, until comparatively recent times, we have used substantially the same assumption in dealing with non-agricultural enterprises. To be sure, we have always recognized numerous breaches in the general system of atomistic or "pure" competition and there have been many who have held the exceptions to be the rule. But the economics upon which most of us were reared discussed the economy in terms of competitive *cum* agricultural examples and then appended a chapter or two on public utilities and monopolies.

At this stage most of us, I believe, have abandoned the notion of general atomistic competition in non-agricultural enterprise; certain progress has been made in investigating the result of widespread jurisdiction over price by industrial units. One of the many tasks which remains, however, is to see the full effects of price jurisdiction and market controls in non-agricultural enterprise upon agriculture.

The best point of departure for this task, it seems to me, is to assume that all economic enterprise is located as to structure along a line between two poles. At one pole, representing competitive industry, we have agriculture and in my judgment not much else. Along the line to the other pole we have all other enterprise distributed in accordance with the degree of monopoly power exercised by the individual producer.² It does not matter for present purposes what the nature of this distribution is; it is important only that agriculture is more or less alone at the competitive pole.

Agriculture, in accordance with the usual analysis, will tend to produce at that scale of output where marginal costs equate with price; this is only an approximation or a norm but it does not lose its significance for this reason. The better our farm management work the more precisely the tendency will be realized; to equate marginal costs with price is after all the aim of farm management budgeting. Likewise for all industries along the line to the other pole, maximum returns are achieved at a scale of output smaller than that which equates marginal costs with price. The value of the marginal product of economic resources, *as an equilibrium situation* does not tend to be equal in different employments. In accordance with the assumptions, it is lower in agriculture than in other lines of activity.

It follows that under conditions of full employment, economic welfare could be increased by shifting resources from agricultural to industrial employments. We would be better off with more industrial and fewer agricultural goods. This is the normal consequence of the difference in structure as between agriculture and

² The measurement of the degree of monopoly is a somewhat vexed question on which I do not propose to enter here. The notion of the spread between marginal costs and price relative to price (the inverse of the elasticity of demand) for the individual firm over a period of time is sufficient for these purposes. Cf. A. P. Lerner: *Review of Economic Studies*, June 1934.

other enterprise.³ Likewise entrepreneurial income in agriculture would be increased by the transfer since the "terms of trade" between agriculture and other enterprise would be altered in favor of the farmer. Under conditions of less than full employment the same situation holds, although there is, in principle, the possibility of drawing upon idle resources for the enhanced industrial output.

Two conclusions may be drawn—though with caution, for I have reached the stage where it is easy to claim too much. First, as a normal situation, agriculture has a tendency to "over-produce" relative to industry. There is more to the agricultural problem than adjustment to a changed situation in foreign demand or than can be explained by the extreme flexibility of agricultural prices during domestic depression.⁴ In the absence of production controls agriculture has a basic or structural tendency to increase output relative to the rest of the economy. It is tempting to go on to argue that this permanent problem of the relationship between agriculture and industry was obscured during the period of rapid economic expansion during the nineteenth and early twentieth century and that it now makes itself felt as the national income ceases to grow and the mature relationships appear.

Second, any increase in industrial concentration will have a positive adverse effect on agriculture. Other things equal, fewer resources will be employed in industry; more will compete for employment in agriculture. (The fact that agricultural areas are a major source of the labor supply is important in this connection.) The result is relatively higher industrial prices and relatively lower agricultural prices. Whether industrial concentration and monopoly power is, in fact, increasing may be debated. Assuming that it has, the effect has been to make the position of agriculture worse.

There is perhaps room at this stage for a query as to whether one is justified in taking a monopolistic organization of industry for granted. If these propositions concerning the structural disadvantage of agriculture derive from a monopolistic industry then why not change the structure of industry? Why not bring industry nearer to the competitive pole by vigorous measures designed to "restore" competition? Many other evils are laid at the door of

³ I am omitting from consideration certain issues concerning the organization of resources under conditions other than of atomistic competition. These do not, I believe, bear upon the substance of my argument.

⁴ Although the difference between agricultural and industrial price behavior during depression is the result of the difference in competitive structure.

modern industrial organization and the view that it should be changed has always been popular at least in academic circles.

In my judgment such a remedy is likely to remain permanently in the stage of academic discussion; I doubt if we are ever likely to do anything to decrease, over all, the degree of monopoly control in industry unless we do a great deal more besides. Apart from any wholesale reordering of the economic system. I think we can assume that the relationship between the competitive *cum* agricultural sector of the economy and the monopolistic *cum* industrial sector of the economy is an enduring one.

Summary

It is now time to return to the problem set for this paper. The answer would seem to me to shape up as follows: in the long pull we can reasonably expect a national income that is substantially better than that of recent years and possibly one that accords with substantially full employment. This means expanded domestic consumption of farm products, higher farm income and a reduced need for (and demand for) measures of agricultural supply and price control. However, even under such favorable conditions we must reckon with structural characteristics of the agricultural industry, the practical effect of which will be, ex-control, production that is relatively high compared to other parts of the economy and terms of trade that are correspondingly unfavorable. In the short run we can expect some expansion of foreign demand; over the long run this conclusion requires that a very different world emerge from the present war than emerged from the last. This conclusion may be more optimistic than sound.

Conceivably, the absolute increase in farm income accompanying a restored national income and expanding foreign sales might be sufficient to meet the income demands of the farmers—this in spite of a very considerable expansion of agricultural output. Under such a combination of circumstances we could perhaps plough under our production control machinery. However, all of the evidence is in the other direction. We have, if my reasoning is correct, a permanent structural situation in the agricultural economy with which to deal. We haven't too much reason to be optimistic about foreign markets in the long run. We might possibly find ourselves in a situation (very difficult to imagine in the case of cotton) where production control and price measures are unneces-

sary; we will not find ourselves in a position where we can safely abandon the machinery. We must look forward to production control in agriculture as a permanent policy for improving farm income; the most we can expect is that it will not always be necessary to invoke the policy.

One forecast can be made safely; it grows out of the same set of circumstances which have made the preparation of this paper a particularly embarrassing task. The determinants of agricultural income is a problem in compound equations and we can expect the various factors in the equation to undergo marked changes in years to come. If it is wise policy to keep the production control machinery we have developed it is equally necessary that it be kept sufficiently flexible so that it can meet a wide array of possible situations. So in keeping the machinery for production control it would appear important that we do not develop any doctrinaire notions as to its use.

SUGGESTIONS FOR A NATIONAL PROGRAM OF RURAL REHABILITATION AND RELIEF¹

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Farm Security Administration

"Poverty is as unnecessary as malaria or yellow fever.

Let that be stated once and for all."

Thomas Nixon Carver—ESSAYS IN SOCIAL JUSTICE

THE simple fact that rural poverty existed in this country was never openly recognized by our government until approximately five years ago. Public recognition of the fact has come still more slowly. The idea of poverty has been traditionally associated with city slums and the great mass of immigrants who came to this country during the last quarter of last century. On the other hand, the "barefoot boy with cheeks of tan," has been a symbol of rural life. He was a healthy little cuss; well supplied with vigor and vitamins; and though his clothes were not decorous, they were always warm and sturdy, and characterized by a rustic simplicity which appealed to our esthetic taste. We have been loathe to recognize the pallid faced youngsters, suffering from infected tonsils, pellagra, or hookworm, subsisting on half enough food of dubious quality and scant variety, clothed in flour and feed sacks, and sleeping on mattresses of straw or corn shucks.

There are, of course, many implications of the fact that the problem of rural poverty has only recently been recognized. An important one, from the viewpoint of this paper, is that there is only a meager bit of generally accepted knowledge upon which to base suggestions for a national program of rural rehabilitation and relief. Research in the field of rural poverty got off to a fairly rapid, though narrow, start three or four years ago. As yet however, the findings are few. Of still greater significance is the apparent fact that there has been little discussion of these findings, and other readily observable facts of a related nature, by the layman.

¹ This paper has been prepared for the Annual Meeting to be held in Philadelphia.

The views expressed in this paper are purely personal. They have not been approved by or discussed with my colleagues in the Farm Security Administration, and in no sense should be interpreted as policies of that organization.

We are, therefore, unable to obtain much guidance for policy suggestions either from research or lay opinion.

The General Point of View

The general point of view with which the problem of rural poverty is approached is of much greater importance to policy-making than the ordinary social scientist might expect. Policy-making in this country is a crude procedure. It involves much guessing and compromising, and, on the whole, is a "rough and ready" process as compared with research and teaching. The details of administration can proceed on a more careful basis, but policy decisions move in a broad general direction like herds of cattle being slowly driven to market while they graze. For this reason the landmarks are of great importance. Public opinion, Congressional action, and Government administrators, are all in need of general guideposts. It is with this thought in mind that I make the following three general suggestions. Their importance seems to me to be great regardless of the type of operating program which is adopted, and the general point of view which they roughly describe is, I believe, essential to almost any wholehearted attack on the problem of rural poverty.

My first suggestion for a national program of rural rehabilitation and relief is that the social scientists rise to some of the challenges that are all around them, and present constructive findings respecting the basic causes of rural poverty and general types of approach by which it can best be prevented or cured. If the terrible fear of losing their objectivity prevents them from suggesting the best courses of action to pursue, let them, at least, predict the most probable results from following the so-called "best" courses of action which are foisted upon us from highly partisan sources or by the constant seekers of special privilege.

Scientific objectivity, an almost irrational reliance on meticulous statistical calculation, a high degree of subject-matter specialization, and an unwillingness to study and appraise the institutional framework within which our day-to-day living takes place, have all combined to blind and sterilize far too many of the keenest and most creative minds among our social scientists to the major needs of policy-making. These factors have been important in focusing too much attention by the few workers who have studied rural poverty upon relatively small matters of detail. They have also

tended to generate a fear of the researcher considering any problem on which he might be forced to take an ethical position. His ethical views creep in as implied or unstated assumptions, and are sneered at by his colleagues as personal bias. Yet policy-making is ethical in nature to its very core. Laymen, legislators, and administrators—the three great policy moulding groups—must make decisions involving the ideas of “good” and “ought,” and these ideas are the central themes of ethics. Nevertheless, the social scientists can have tremendous influence in shaping Government policy respecting the problem of rural poverty provided: (a) That they understand the nature of policy-making, particularly the importance of public opinion and legislative reaction to this opinion; (b) That they are willing to rise above petty bickering among themselves over questions of detail and dig deep into the organizational functioning of our society, including the influences of traditional beliefs, habits and customs; (c) That they prosecute these studies with a view to suggesting improvements in the functioning of our social organization while at the same time maintaining an unwillingness to be bound by the assumptions imposed by the organizational and institutional framework of the society which we happen to have at the present time; and (d) That they are willing to get into the arenas where public opinion and Government policies are made and “slug it out” with the brethren of ignorance, greed, and special privilege.

A second suggestion is that there needs to be a great educational program aimed at teaching all elements in our population the tremendous influence of environment in shaping personality. There is lurking in the back of the minds of literally millions of our people attitudes to the effect that inferior social status is almost wholly a result of inborn characteristics, and that it is fruitless to try to do anything about it. As a nation we have been too proud and arrogant to admit that our social system—the way in which we live—was the real source of blighted and dwarfed personalities, and the indirect, if not direct cause, of most of our welfare problems. Moreover, we have been aided and abetted in blindly clinging to our pride and ignorance by constant propaganda on the part of those who fear their status will be impaired by the mass of our people knowing the truth.

This is no place in which to review the literature on the age-old problem of “nature versus nurture” in determining intellectual

achievement, but there is abundant scientific evidence to explode the popular myth that inferior social status is a result of hereditary factors. Indeed, it has not yet been shown conclusively that there is any relation between social status and hereditary capacity among rural people. However, one does not have to take such an extreme position in order to understand the great influence of environment in shaping personality. "The children of definitely moronic mothers and laboring class fathers, if placed early in good foster homes, will turn out to be above average in mental ability."² This quotation expresses a simple idea, but one of tremendous importance to any large-scale attempt to cope with the problems of poverty. It is extremely doubtful that we can have a sustained program of rural rehabilitation and relief in this country, of such a nature that it is able to cope in a fundamental manner with the preventative aspects of rural poverty, unless there is a much, much wider recognition of the influence of environment on the lives of people.

The third general suggestion is of a different category from the other two. It pertains to the ethical basis of any program aimed at alleviating poverty conditions. Because the business man, including the business minded farmer, rules this country, we are in the habit of explaining or rationalizing programs of every conceivable nature by appealing to the self-interest of our rulers—by showing how their pockets can be lined with gold by the Government doing thus and so. We are apt to miss the simple point that any program aimed at alleviating poverty, if it is to be of long duration and virulent enough to tackle fundamentals, must stand or fall on other grounds.

It is suggested that the correct ethical conception of any program aimed at ameliorating or destroying rural poverty should be that such a program is one means by which Government renders justice. The word "justice" has been used in many different ways. Ordinarily it has, at least, two distinctly different connotations. On the one hand, justice is concerned with the prevention of disturbance—the necessity and theory of punishment. On the other, justice is concerned with the distribution of the good things of a society among the groups and individuals who compose the society. It is in the latter sense that we may correctly view a rural rehabilitation and relief program as an instrument for rendering justice.

² Stoddard, George I., *The Educational Record*, Supplement 12, January, 1939.

In other words, we are concerned, insofar as the ethical dimensions of the problem are relevant, with a question of distributive justice. This view of the problem immediately raises a question as to what principle of distributive justice should be followed.

An ideal principle which should be followed as far as existing knowledge and mechanics of operation will permit can be stated as follows: *the distribution should be of such a nature as to enable each individual to develop himself to his greatest extent—to realize his own inherent personality—provided that such a scheme of distribution does not permanently lower the total to be distributed.* Correlative with this principle is the further concept that the needs of the individual for his fullest development should, wherever possible, be scientifically determined, and should in all instances extend beyond mere material needs. Equal needs should receive equal shares, subject to the proviso mentioned above.

As a practical matter there is very little likelihood that this ideal principle can be followed. It is not only lacking in public support, but it has some very important administrative shortcomings. The difficulty of measuring the needs of each individual to develop himself to his greatest extent is practically insurmountable in the present state of knowledge respecting human personality. Even in the case of the purely physical needs of food, clothing, shelter, medical care, and rest, it is virtually impossible to estimate with any acceptable degree of accuracy the needs of a given individual to bring about the greatest development of his inherent personality. When we visualize the analogous problem of calculating the non-material needs of the same individual, the application of the ideal principle becomes a bit frightening. As yet we know too little about personality and factors affecting its development.

These difficulties can be largely eliminated by two adjustments or modifications of the ideal principle.

The problem of measuring the material needs of the individual can be resolved in a fairly satisfactory manner by introducing the idea of a minimum standard. For instance, it is not extremely difficult to calculate for given individuals, the minimum requirements of food, clothing, housing, medical care, and rest, which are necessary to develop and maintain their bodies in a healthy and vigorous state. Moreover, the judgment as to what constitutes a healthy and vigorous body can be made in a fairly objective and scientific manner by recourse to existing medical knowledge. With only little less

accuracy the land resources, capital equipment, and management practices necessary to produce the minimum requirements (or the funds with which to purchase them) can be determined.

The idea of a minimum standard is not, however, so easily applicable to the non-material aspects of culture. By analogy we might say that everyone should share in the non-material features of our culture to the minimum extent necessary to develop and maintain a healthy and vigorous intellect. It is not wholly inconceivable that the psychologists and sociologists could set up rough minimum standards, for given culture areas, along these lines. They would have, however, severe practical limitations in application. There is probably a better way of meeting the problem by recourse to the ideas: (a) that all persons in our society should have equal legal and constitutional rights and privileges; and (b) that all persons should have an equal opportunity to participate and share in the basic non-material aspects of our culture, such as are made available to individuals through schools, courts of law, religious organizations, political parties, and the more informal habits and customs of community life.

We have, therefore, largely because of lack of knowledge respecting human personality, suggested two important modifications of the ideal principle of distributive justice. One is to the effect that each individual should have, at least, the minimum material prerequisites necessary for the growth and maintenance of a healthy and vigorous body. The other is that each individual should have equal legal rights and privileges and an equal opportunity to share in the non-material aspects of our culture.

Although the necessary list of suggestions to make up a complete general point of view could be expanded much further, the three which have been mentioned—(1) the suggestions for further research; (2) the need for a much greater public recognition of the tremendous influence of environment in moulding personality, and (3) the view that a program of rural rehabilitation and relief is one means by which Government renders justice, and the subsequent discussion of the principle of distributive justice—are sufficient to open up the nature of the problem, and indicate how much thinking yet needs to be done about the general framework of any national program aimed at ameliorating poverty conditions in agriculture.

The principal remaining task is to indicate the operational nature of a program of action aimed at coping with the problem of

rural poverty as it exists here and now. As in the preceding discussion the task will be approached by making a series of suggestions rather than attempting to "spell out" a complete and well-rounded program in all of its detailed and multifarious aspects.

The Operative Program

Before making specific suggestions for preventing, curing, or ameliorating poverty conditions in agriculture, we need to know something of the scope and extent of poverty, a bit about its general manifestations, and, if we are to attack it with longtime preventive measures, we need to know something of its causes. The limitations of space permit only hasty mention of these points here.³

If we are to be consistent, we should use the two modifications of the ideal principle of distributive justice, discussed above, as the yardstick by which the volume of rural poverty should be measured. In other words, if we knew: (a) How many people there are in agriculture without the necessary material prerequisites, such as, food, clothing, housing, and medical care necessary for the development and maintenance of healthful, vigorous bodies; (b) The additional number who cannot avail themselves of ordinary legal rights and privileges; and (c) The number in addition to these two groups who do not have an equal opportunity to share and participate in the non-material aspects of our culture, we could add the three figures together and have a quantitative expression of the extent of rural poverty. Obviously we don't have any such figure, and, moreover, we are not likely to have it at any near date in the future. Reliance must be placed upon other indices. Perhaps the best single index of rural poverty is family income. It is a composite figure and is usually associated with other intangible factors which play a large part in measuring the extent of poverty. It has many limitations, but can be used in lieu of better information.

According to the comprehensive study of consumer incomes in 1935-36, published by the National Resources Committee last year, there were approximately 1,090,000 non-relief farm families in the United States in 1935-36 who had a total income per family, including commodities produced for family consumption, of less than \$500. The number of farm families receiving some form of di-

³ For a fuller and more complete discussion see: *Seven Lean Years*, by T. J. Woof-ter, Jr., and Ellen Winston. The University of North Carolina Press, 1939.

rect or work relief during the year was estimated to be slightly more than 600,000. If we assume that 500,000 of these had incomes of less than \$500 per family, we obtain a total of approximately 1,590,000 farm families, each of which had less than \$500 on which to live for a year. This represents almost 24 per cent of all farm families in the nation.

TABLE 1. DISTRIBUTION OF NON-RELIEF FARM FAMILIES BY INCOME LEVELS, 1935-36¹

Income level	Number of families	Percentage of total families	Cumulative percentage of total families in each group
Under \$ 250	232,040	3.8	3.8
\$ 250-\$ 500	858,963	13.9	17.7
\$ 500-\$ 750	1,108,400	18.0	35.7
\$ 750-\$1,000	1,027,044	16.6	52.3
\$1,000-\$1,250	793,250	12.8	65.1
\$1,250-\$1,500	601,571	9.8	74.9
\$1,500-\$1,750	433,590	7.0	81.9
\$1,750-\$2,000	297,221	4.8	86.7
\$2,000-\$2,250	188,336	3.1	89.8
\$2,250-\$2,500	152,309	2.5	92.3
\$2,500 and over	473,834	7.7	100.0
All levels	6,166,558	100	100

¹ Arranged from data in: *Consumer Incomes in the United States, Their Distribution in 1935-36*, published by the National Resources Committee, Washington, 1938.

Somewhere around the range of family income of from \$500 to \$750 must be the line below which all would agree that poverty exists. Although no one can presume to have adequate information on the point, it is probable that the group below \$750 includes: most of the farm families who do not have the minimum material prerequisites for the development and maintenance of healthy, vigorous bodies; most of those who cannot avail themselves of ordinary legal rights and privileges; and a considerable number of those who do not have an equal opportunity to share in the basic non-material aspects of our culture.⁴

In order to be ultraconservative, perhaps we should ask: Does

⁴ It should not be inferred that lack of income is the only cause of families having restricted legal rights and privileges and an unequal opportunity to share in the non-material aspects of culture. It is being used here merely as a single index; not as the causal force.

this group with incomes below \$750 include families other than those in the three categories just mentioned? This question can't be answered accurately, but a rough approximation to an answer can be had. The average annual cost of the basic physical requirements of food, clothing, shelter, and medical care necessary to maintain a farm family of five in a healthy condition over a period of time, appears to run in excess of \$500 in all major regions of the country (Table 2). These requirements have been calculated on a basis al-

TABLE 2. ESTIMATED ANNUAL VALUE, AT 1936 PRICES, OF MINIMUM PHYSICAL AND CULTURAL REQUIREMENT FOR A FARM FAMILY OF TWO ADULTS AND THREE CHILDREN IN THE THREE MAJOR REGIONS OF THE COUNTRY¹

Items	Value of minimum physical requirements			Value of minimum physical and cultural requirements		
	North	South	West	North	South	West
Food	\$385	\$375	\$405	\$385	\$375	\$405
Clothing	75	45	80	125	80	125
Shelter	150	110	155	220	160	225
Medical care	20	20	20	30	30	30
Education	—	—	—	20	20	20
Recreation	—	—	—	10	10	10
Church and charity	—	—	—	10	10	10
Reserve for contingency	—	—	—	20	20	20
Total	\$630	\$550	\$660	\$820	\$705	\$845

¹ These estimates were made by M. Attie Souder, Associate Home Economist, and arranged for this presentation by John A. Baker, Associate Agricultural Economist, both of the Farm Security Administration staff in Washington.

In calculating the minimum diets for the maintenance of health liberal use was made of foods that could be produced on the farm so as to displace as far as possible the necessity for purchasing food. Farm prices were used for foods produced on the farm and retail prices for foods which would have to be purchased. The estimated value of home produced food was \$270 in the North, \$300 in the South, and \$280 in the West. Household operating expenses and the maintenance of household furnishings and dwelling were included in the estimated annual cost of shelter.

most as low as a businesslike owner would maintain his slaves. When a minimum of non-physical requirements are met, the annual cost runs above \$700 in the South and to almost \$850 in the West. The budgets in Table 2 are extremely conservative when we think of a family of five living at these levels, not for just a year, but for the major part of their lives.

We are virtually forced to the conclusion, from a consideration of these budget requirements, that the group with less than \$750 income cannot possibly include very many families above the poverty line as defined by the three criteria which are modifications

of the ideal principle of distributive justice. Indeed, there is good reason to believe that a strict application of these criteria would substantially raise the figure of 2,199,000 non-relief farm families with incomes of less than \$750 in 1935-36. The addition of the 600,000 families receiving relief in that year brings the total to approximately 2,800,000. We may need to make some adjustments because the average size of family is apparently a little less than 5 persons. Yet it appears extremely conservative to conclude that one-third of the farm families in the nation were below the poverty line in 1935-36. At least, 15 per cent must have been in dire physical need, and were living at a level which was impairing their health. Is the situation any different today? It seems reasonable to believe that some improvement in general farm income plus the work of the Farm Security Administration has measurably raised the physical level of living of the lower 15 per cent. However, it is very probable that one-fourth to one-third of all our farm families are still below the poverty line.⁵

Rural poverty manifests itself, of course, in many ways other than the external appearances of poor houses, meager clothes, scant food, and poor household and farm equipment which are direct and obvious concomitants of low income. Poor health, low intellectual development, timidity, low morale, little participation in community and government affairs, and scores of similar characteristics are direct results of poverty. The health situation can hardly be overstressed. A few months ago the Farm Security Administration had every member of 100 very low-income families, in two counties of the Southeastern Cotton Belt, thoroughly examined by competent physicians. There were 575 people in these families. The examinations showed that there were: 288 cases of diseased tonsils; 31 cases of suspected tuberculosis; 360 individuals with diseased teeth; 192 cases of rickets among the children; 124 cases of defective eyesight; 21 cases of hernia; and of 109 mature women in the group, 79 were suffering from injuries resulting from childbirth, and 21 had suspected cancers. Other important manifestations of poverty cannot be so easily tabulated and summarized, but they are, nevertheless, very real and very important. Ignorance and superstition are both

⁵ The reasonableness of this estimate can be roughly checked by reference to the 1930 Census data which indicated that there were about 1,700,000 farms which yielded total gross incomes of less than \$600 in 1929. Some of these were small, part-time farms, of course, but some were tenant operated and the income had to be divided with the landlord.

potent forces to be dealt with in any program to improve the condition of the poverty stricken.

Perhaps enough has been said to indicate, in a rough and sketchy way, the extent and principal manifestations of rural poverty. A more important question is: Specifically, what can and should be done about it? An answer to this question involves some knowledge of the causes of rural poverty. Inasmuch as causal factors have to be treated very superficially in a paper of this kind, they can probably best be discussed in connection with specific suggestions for future action. The basic problem is twofold. First, to open up for these low-income farmers new and enlarged opportunities—economic, social, and political—which can be maintained with some semblance of security. Second, to train and educate them to take advantage of the opportunities at hand. We need to proceed along both lines at the same time. In general, this is the way in which the program of the Farm Security Administration has been carried forward.

Its experiments with the community type of settlement is a definite attempt to develop new patterns of rural living which will afford opportunities not available to isolated farmers (or stranded groups). These experiments have proceeded far enough so that it can definitely be said that new social opportunities are being made available to the approximately 13,000 families residing in the project communities. Moreover, it is quite evident that the families are learning to avail themselves of these new opportunities as indicated by: their attendance at school—from the kindergarten to the adult evening class—their purchasing and processing of commodities through cooperatives; and their participation in various types of recreational groups. It cannot be stated with such definiteness that the new patterns being experimented with have opened up new economic opportunities over and above those characterized by the scattered farm type of settlement. Almost without exception, however, the economic status of the families on projects has been substantially improved. As to whether their economic situation will eventually improve greater than that of the control families on scattered units, cannot now be predicted.

In the rural rehabilitation program, and the newer program of liberal loans to selected tenants with which to purchase farms, less emphasis is given to experimentation with new forms of social organization. The chief attempts in these programs is to make avail-

able to the individual low-income farm family the few additional economic opportunities that can be arranged in their particular setting, and to lay great emphasis upon teaching them to take advantage of what they have.

The first step with a family is for the county supervisor of the Farm Security Administration to aid in making the best possible tenure arrangements for a farm. The families selected to become owners of their farms, under the provisions of the Bankhead-Jones Farm Tenant Act, are made a 40-year loan at 3 per cent interest, payable at a variable annual rate depending upon the net income realized each year.⁶ Ordinarily, however, the tenure arrangements are written leases between the landowner and the FSA borrower. Every reasonable effort is made to obtain three to five year leases with provisions for the tenant to receive compensation for improvements. Poor tenure arrangements are a very substantial cause of rural poverty.

The second step is to reduce, or otherwise adjust, the outstanding debts of the family, if they are above their ability to pay, and if the creditors will voluntarily agree to reduction. A very large percentage of the families in the group reached by the Farm Security Administration are hopelessly burdened with debts of every conceivable kind. These debts are not only an important source of their difficulty, but also an explanation of why they have been able to exist when their incomes were so low.

The third step is for the farm and home supervisors, working together, and with the family participating, to draw up a farm and home operating plan. It takes into consideration the needs of all members of the family, their abilities, and their resources available for production. The plan is quite a detailed one, including not only crop and livestock production schedules, but also farm and family expense budgets, and loan repayment provisions. On the basis of this plan, which, among other things, shows the capital which the family has and the amount needed to carry out the farm operations and consume as family living, the amount of the loan is determined. The loans are secured by crop and chattel mortgages; extend from one to five years; and bear five per cent interest. Throughout the country, the plans are made so that the family will produce as much of their food and feed requirements as is reasonably possible.

⁶ At the end of the second year of the tenant program, July 1, 1939, approximately 5,000 tenants had been loaned money with which to purchase a farm.

The fourth step is the follow-up supervision and guidance, which is the real educational part of the program, as well as the real security for the loan. Each borrower is usually visited from four to twelve times per year either by the home supervisor or the farm supervisor. In addition, the borrowers commonly visit the supervisor's office several times a year. It is during these farm and home visits that the family is taught how best to organize and manage their farm and home; how to keep and use farm and home records; and how to manage their meager finances. Some of them, especially in the South, had never assumed the responsibilities of managing their own affairs before they became borrowers of the Farm Security Administration.

Obviously, this program of farm and home planning, followed by supervision and guidance, is an adult education program of vast scope. It strikes at ignorance and carelessness, two of the causes of rural poverty. Its results go far beyond the increased farm income and higher standard of living which it directly brings about. It not only brings renewed hope, but also increased ability. Over a long period of time it must inevitably tend to both cure and prevent rural poverty. On July 1, 1939, there were 386,700 farm families who were borrowers of the Farm Security Administration and were carrying out planned farm and home management practices under the guidance of the field personnel.

In addition to the program of loans to individual families based on farm and home plans, and followed up by supervision and guidance, the Farm Security Administration also has an extensive program of promulgating simple types of community and cooperative services, and, within the last three years, has instituted an extensive program of cooperative health insurance. Loans are made to the individual low-income families to participate in a joint effort with their neighbors in providing the services of heavy farm equipment, purebred sire services, limestone crushing equipment, small canning plants, and even in some instances, sewing machines and laundry equipment. At the end of the 1939 fiscal year, 9,643 group services of this nature had been provided, and 198,000 families were participating in the groups. The cooperative health insurance program is apparently the first attempt of its kind in this country to provide medical care for low-income farmers. The ordinary borrowers of the Farm Security Administration are made annual loans (sometimes it is necessary to make direct grants instead of loans)

amounting usually from \$20 to \$30 per year to participate in a cooperative medical association. Most of the associations are on a county basis and include from 100 to 200 members, although a few are considerably larger. The funds of the members are pooled and usually divided into 12 equal monthly instalments. The association then enters into an agreement with the doctors (dentists and hospitals are also sometimes parties to the agreement) to provide emergency medical care, upon request, to any family which is a member of the association. The individual doctor renders an itemized bill for services performed at the end of each month. These bills are reviewed by a committee of doctors before they are presented to the association for payment. The monthly apportionment of the pooled funds are then used to pay the bills. If the apportioned funds available are not enough to pay each doctor in full, they are allocated to the individual doctors in proportion to the amount of their bill. As of July 1, 1939, there were 228 such associations in operation with a membership of 26,900 families.

Another feature of the Farm Security Administration program is that of making emergency loans and grants to farmers in distress because of natural catastrophes. Every year there is a surprisingly large group of farmers who are faced with emergency conditions such as, droughts, floods, hailstorms, cyclones, and intensive insect damage. Many of these farmers are left virtually destitute, others are forced into a permanently insecure and low-income status, while still others are merely temporarily handicapped for operating capital and funds for family living. The extended droughts of 1934 and 1936, of course, affected large areas of the country and made emergency financing necessary for thousands of farmers. The Farm Security Administration since its inception has made emergency loans and grants to farmers in distress because of such conditions. At the end of the past fiscal year, the Farm Security Administration had outstanding emergency loans to 189,254 farmers. Most of these, of course, were made during the severe droughts of 1934 and 1936.

The features of the Farm Security Administration program which have been mentioned—improved land tenure arrangements, voluntary debt adjustment services, operating loans at a reasonable rate of interest, farm and home planning combined with supervision and guidance, the promulgation of community and cooperative services, the cooperative health insurance scheme, and loans and grants to farmers suffering the effects of natural catas-

trophes—are all important and proven techniques with which to alleviate poverty conditions in agriculture. They are both preventive and curative in their effects. Poverty breeds poverty, and, as a glance at the birth rates will indicate, the breeding rate is very rapid. It appears perfectly reasonable to suggest that techniques essentially the same as these should be used in a greatly expanded way, if we are really interested and sincere in our efforts to destroy rural poverty.

It would be wholly unwise, however, to assume that these techniques alone will be effective enough to raise from a fourth to a third of our farm families above a poverty level of existence. The program of the Farm Security Administration is by no means a complete attack upon the problem of rural poverty. Two of its weakest points are immediately obvious.

First, it has had limited influence in improving rural housing conditions. Considerable experience has been gained in rural housing through the program of community projects and in the administration of the Bankhead-Jones Farm Tenant Act. This experience has been of real value in setting standards for rural housing, and in indicating the costs of houses of different sizes and types. However, it is far short of a comprehensive rural housing program. From the experiences thus gained, and from the great need which exists, it is suggested that the Federal Government institute a large scale, subsidized program of rural housing. People who live in hovels will never rise above the poverty level, and unless there is some cataclysmic reorganization of the whole American economy, there are thousands of farm families who cannot earn enough from farming to provide themselves with decent houses. The alternative suggested is that the cost of such a program be partially borne by families with higher incomes, through Federal income taxation.

A second obvious weakness in the present rural rehabilitation program of the Farm Security Administration is that it cannot bring its techniques into operation to effectively aid families who do not have fairly adequate land resources. This limitation excludes to a considerable degree: (1) A large group of agricultural laborers;⁷

⁷ The living conditions of migratory farm laborers are being raised through the construction and operation of camps, in which the migrants can live for a limited time at a nominal cost. At the present time, these camps are situated mainly on the West coast and in a few other scattered areas. They are adapted principally to the needs of migrant workers, and as yet are not sufficiently numerous to fill a fraction of the need for decent living conditions among this type of worker.

(2) Many farmers on holdings of inadequate size; and (3) A certain proportion of farm youth who are maturing faster than older farmers are retiring from agriculture. There are some indications that mechanization and restriction of acreage are both operating to increase the number of farm laborers. It is quite clear that the rate of population increase in rural areas, combined with industrial unemployment and general lack of opportunity in non-agricultural pursuits, is piling up an increased number of young people on farms. Moreover, there are indications in some areas, largely because of population pressure, that farms are becoming smaller, or that a large number of families are being pushed on to very poor lands where their standard of living cannot hope to be substantially raised without increasing the size of holdings. Certainly, any complete program aimed at alleviating rural poverty will have to make new opportunities for these three groups of families.

The situation presented by increasing population in rural areas while opportunities remain stationary or decline, is, of course, one of the major problems confronting the nation. It presents the great challenge of this century to constructive planning. It may be true that half the problem of rural poverty is really the problem of industrial stagnation and urban unemployment. Unless the European war substantially changes the nature of our civilization, there seems to be only three alternatives available if we are to drive the spectre of poverty from the rural scene: (1) We can reorganize our industrial economy and put it on a basis so that it can expand, and thus drain off surplus farm population; (2) We can reorganize our agricultural economy so as to drastically redistribute land resources and encourage the development of a more completely self-sufficing type of farming; or (3) We can do both of these things in a partial manner at the same time. The first alternative seems the most reasonable and rational course to pursue, but the third is more likely to happen.

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REVIEWS

These Are Our Lives, Federal Writers' Project. Chapel Hill, University of North Carolina Press. 1939. Pp. xx, 421. \$2.00.

Rural Families on Relief, Carle C. Zimmerman & Nathan L. Whetten. Washington, D. C. 1938. WPA, Division of Social Research Monograph XVII. Pp. xxiv+161.

Here is rural life in sombre colors, and here is the battle of the methods in concrete form: case studies vs. statistics. But here also are more materials to aid our understanding of those segments of our population who too often escape the view of laymen and scholars alike when they speak of "the farmer" or "rural people."

Not that we lack reliable materials searching out the fringes of the agricultural world. Strictly, these publications add little to the impressions which the well-read will have formed from the innumerable studies carried out during the depression. The value of these reports is two-fold. They add important verification to conclusions previously published. And a comparison of the two books furnishes grounds for judging the merits of these two research methods.

Although the formal topics for report in Zimmerman's and Whetten's study are familiar to readers of previous reports in this series, the authors have integrated their data with accepted sociological theory much more successfully. Consequently the data are more meaningful to the professional readers.

They show how rural families came to need relief in large volume as a result of the cumulative action of numerous long-time price and production conditions, intensified by the conjuncture of depression factors. Equally important is the fact that these bore with quite unequal effect upon different areas and classes. In certain regions there was also the loss of part-time industrial employment and the special situation of drought.

Succinct typological summaries of rural farm and non-farm relief conditions in each of the type-of-farming areas reveal the variations in rate of relief, class incidence, family composition, standards of living, education, fertility, mobility, and degree of social disorganization.

Disregarding regional differences, the report shows farm and non-farm relief rates about equal, but within agriculture the different classes suffered disproportionately. In the rural towns also

relief was needed more by those of lower status. Unusually high relief rates marked families without a bread winner or those with more members, especially those families having many in the dependent ages. Mobility, both social and geographical, is shown to be closely interlocked with economic vulnerability. And again we see that education, whether cause or index, is closely related to the ability to remain independent.

Finally, the authors deserve commendation for their success, despite lack of space for adequate discussion, in displaying the backgrounds of relief: resources, population pressure as interrelated with mode of life and family system, family cohesion, community structure. Too often studies of relief relate the incidence of aid to purely statistical coordinates without going on to examine the sociological framework in which the problem appears.

To read "These Are Our Lives" is to enter another world. To be sure the lives are those of humble folk: poor farmers and croppers and laborers, mill workers, persons in menial occupations, and those on relief—plus a few substantial business and professional men who mirror the lives of the lowly. The conditions implied or asserted as the causes for the unfortunate lot of such people are the same as those depicted in the WPA report.

But the pictures drawn by the two books are quite different. They have different perspectives not merely because the one presents impersonal forces incarnated in the lives of real people, but rather because of the inherent contrasts of case study and statistical procedures.

These "Lives" do impress one with the frightening insecurity endured by so large a part of the nation. They show, too, that remarkable vitality and hopeful endurance of the poor which is so crucial in any social order. They dramatize the insidious and pervasive ways in which the impersonal world moulds the fortunes of real people. All this is artistically and persuasively expressed by the contributors, and for this ample credit is due; nor can one complain that they did no more. Those who would reform the world can find no better evidence. Those who work with rural data should read this book to remind them that concepts and statistics are abstractions.

But from these biographies one can obtain no valid conclusion as to which factors are more important, which types of dependency or relief are most widespread, or how often the depicted situations

really occur. In short, the indispensable questions of how many, where, how, and when cannot be approached by this method.

We recommend the reading of Zimmerman and Whetten, or a similar report, to obtain a rounded if incomplete picture of the "sub-marginal" rural folk. Then read "Our Lives" to realize in microscopic detail what these folk are like as they live out their struggles. Then reread the other study to regain a sense of proportion and some guidance as to feasible problems and procedures of action.

C. ARNOLD ANDERSON

Iowa State College

Montana Farm Foreclosures, R. R. Renne, Montana Agricultural Experiment Station Bulletin 368, 1939, 58 pp.

Professor Renne's Bulletin includes a critical analysis of the number, characteristics, and causes of farm mortgage foreclosures over a 70-year period, with some suggestions for reducing the number of these foreclosures in the immediate future. In the development of this project the Montana Experiment Station had assistance from the Works Progress Administration. This involved a careful examination of 34,000 real estate mortgages embracing 11 million acres and 75 million dollars in loans. The records in question go back as far as 1870 and they conclude with January 1, 1938.

It is shown in this study that four fifths of these foreclosures or an average of nearly 3,000 yearly occurred during the decade of the 20's; and nearly two thirds or an average of 4,000 yearly during the 5-year period 1921 to 1925. This is equivalent to one mortgage foreclosure for every two farms in the state during this 5-year period. Since 1930, foreclosures in Montana have averaged 500 yearly or almost one per cent of the total number of farms. A comprehensive study of this character is not only of direct value to Montana farmers and ranches but it also carries lessons of primary significance for men engaged in the agricultural industry in adjacent states. It should also be of interest to students of credit from Maine to California.

Causes.—The relatively high amounts loaned per acre during the war years and low crop prices and declining yields in the years following were undoubtedly among the most important contributing factors in bringing about the unusually high rate of foreclosure in

the early 20's. While the amount loaned per acre on farm mortgages which were foreclosed during the 5-year period, 1921 to 1925, averaged slightly more than 40 per cent of the average estimated farm value, it is significant that in the years 1926 to 1930 this percentage increased to more than 60, and on farms foreclosed during the 1931-1935 period loans were equivalent to more than 100 per cent of the farm value. It is suggested that this trend may have been caused in part by overlending in the war period as well as by the deflation in land values which occurred after the war.

The author indicates further the need for revising farm loan policies so that the annual debt service charges (principal and interest payments) are more flexible and adjustable to current ability to pay. Other points considered in appraising the causes for foreclosures are (1) the amount loaned per acre in relation to the total size of the loan, (2) the character of the borrower and the tangible property given in security for the mortgage, (3) the ratio of real estate mortgage debt to productivity value, (4) the length of the period through which the loan extended, and (5) the rate of interest. Important comments might be made on each of these items if space permitted.

Remedies.—The Montana farm foreclosures are discussed in a somewhat impersonal and largely statistical manner. The author directs attention to the fact that there is, however, a human side to the picture that must be considered—the hardships, despair, disillusionment which must have accompanied these failures if we are to appreciate fully the need of a sound farm credit program. Four suggestions designed to improve farm credit practices thereby sparing communities, debtors, and creditors alike the economic and social losses which foreclosure involves are presented for the consideration of the reader and student. These suggestions may be stated briefly as follows: First, the amount loaned on a given unit of agricultural land should be based primarily upon productivity; second, the annual repayments on a given piece of farm property should be adjusted to current ability to pay; third, land values and farm investments should be stabilized through an educational credit program; and fourth, improved farm management and land utilization practices should be incorporated in the farm mortgage agreement.

L. A. MOORHOUSE

Colorado State College

Composition and Characteristics of the Agricultural Population in California, George M. Peterson, California Agri. Exp. Station, Bulletin 630, 1939, 48 pp.

Americans, in general, shift easily from one occupational group to another. Occupational status is not necessarily transmitted from father to son, and many workers shift from one occupation to another during their occupational careers, or even during any one year. They frequently lack the identification with one occupational group or clan which characterizes the social structure of older and more stable societies.

Our official statistics have reflected this fluidity of occupational status. They have given the occupation of those persons classified as gainful workers but have not attempted to allocate those persons who are non-workers to any one industry. Some European statistics classify dependents by the occupation or industry of the head of the household, thus giving figures on the number of persons dependent upon agriculture, mining, manufacturing, pensions, etc.

The U. S. Census classifies the total population by residence as urban and rural, and further subdivides the rural into those living on farms and those not on farms. Starting with these data, as well as those showing occupation and industry of the gainful workers, Professor Peterson has undertaken the arduous task of working out for California the agricultural population, i.e., the total number of persons dependent upon agriculture, and to give some information concerning them.

The rural farm population as reported by a census taken in either January or April would not give the total population dependent upon agriculture, for many farm laborers would be living in towns and cities at that time. Moreover, many persons living on farms are not engaged in or dependent upon agriculture. Thus, although the rural farm population of California on April 1, 1930 was reported as 579,350 and the total farm population as 620,506, the author concludes that the total agricultural population was 877,373, of whom about 40 per cent were not living on farms on January 1, 1930. In order to arrive at this estimate it was necessary to work with the classification of gainful workers, based on the individual's report of his usual occupation as given by the Population Census, and the allocation of only one farm operator per farm as given by the Census of Agriculture.

Careful attention to the details of the data and their pitfalls re-

quires that numerous assumptions be made to supply missing details. Some of them apply generally; some of them are based on conditions special to California; others, such as the alleged under-enumeration of farms in 1930, apparently must be taken on the author's say-so. It does not detract from the work done that the agricultural population as estimated comprises 15.5 per cent of the population of the State, and that gainfully employed males in agriculture as reported by the Census were 16.5 per cent of all gainfully employed males. The chief contribution of this Bulletin is to clarify the statistical definition of the agricultural population, which has recently frequently been the object of legislative action. Incidentally, the data given throw light on a number of problems of California's agriculture which currently are receiving much public attention.

CONRAD TAEUBER

Bureau of Agricultural Economics

Hunger and History, E. Parmalee Prentice. New York, Harper and Brothers, 269 pp. \$3.00.

This is a remarkable book not only for its erudition—it is filled with citations from a multitude of historians and authors classical, medieval and modern—but also for its vivid use of language. I never realized before the miserable poverty of the masses of European peoples prior to the last two centuries. Most of the book is given to detailed description of the conditions of living in past ages, but the author's conclusions as to the causes of the sudden burst of productive power and increase of population during the last two centuries are of greater interest to economists. These can best be given in the author's own words—

"Surely there is something here to think of—a period of 2,300 years of human history in which progress was so slight that, at the end of that time, the conditions surrounding the lives of our great-grandparents were more like the conditions surrounding men who lived in the time of Plato or Scipio Africanus than they would be to conditions which prevail in Europe or America today! The great changes which distinguish modern life have come, then, since the year 1800 or, in figures, the history of modern civilization divides into two periods, one of 2,300 or more years, the other of 139 years. The striking phenomenon of the long pause and the quick growth must be understood if we are to entertain any reasonable ideas of

the course of man on earth, and the explanation is in the story of Food and Freedom. Man's outlook upon nature had changed in the course of 2,000 years, and the world was ready for an advance. When commons were abolished, the opportunity came. Thereafter, man could control his own field, enjoying, in St. Jerome's phrase, the fruit of his labor, and so an inducement was offered to private ambition. Once more there was surplus produce and this surplus brought leisure and an opportunity for study. Man could lift his eyes from the ground and his hand from his work and out of it all came machinery and our industrial civilization. Freedom, opportunity and the inducement which the right to enjoy the fruits of one's labor brings, were the source of Progress. . . .

"And all through those millennia of suffering, man was ready and able to move ahead. He had the intelligence that he has now. What he needed was freedom to use that intelligence. When governmental restraints were removed, when the right to enjoy private property was established and protection given from confiscation, from invasion of personal rights and from excessive taxation—all the rest came very quickly. . . .

"Mediaeval history, therefore, is an impressive demonstration that by wrong policies governments can reduce mankind to want and can bring civilization to the verge of extinction. Policies which deprive the farmer of independence in the use of land, which restrict cultivation or destroy what has been produced, are farming for famine, and the same can be said of debasing the currency in order to raise prices. . . . If food and other necessities of life are adequate in quantity and variety, and if men are free, there will be industry. If savings are secure from confiscation and debasement, there will be thrift; and an industrious, thrifty people make a prosperous and rich nation."

The chapters entitled "History of the Milk Industry" and "Five Centuries of Poultry History" provide many interesting items, especially unusual compilations of historical excerpts. The last two chapters "Abundance" and "Effect of Abundance on the Human Mind," are thoroughly worth reading by modern economists, who wish to appreciate Adam Smith and the classical economists of England.

Two excerpts in conclusion:

"We have had abundance and freedom and democracy, and it may be that these are not three sisters as we had thought them, but

three names for one heavenly visitor whose stay on earth may be short."

"Every person in our western world should know that there is no assurance that present conditions of comfort can continue, and that the question whether there is to be progress and happiness in the future depends upon our ability to maintain industry, prudence and thrift among our people, and upon our capacity to continue to produce in the future such men as those to whom we owe our progress in the past. We want genius in all its forms, executive, scientific, literary and aesthetic. What price would be too great to pay if by paying we could bring into existence such men as those to whom we owe the Conquest of Hunger and the degree of abundance that we have today?"

In criticism of the book I should note that the author does not appear to comprehend fully the limitations in modern civilization upon "the principle of population" as enunciated by Malthus, nor the implications to agriculture, probably to industry and commerce also, of a declining population. He realizes that every civilization in the past has declined but fails to see, apparently, that this decline has been associated with a decrease, not an increase in population.

O. E. BAKER

Bureau of Agricultural Economics

The Wholesale Marketing of Fresh Fruits and Vegetables in Baltimore, Robert G. Deupree, Baltimore, The Johns-Hopkins Press, 1939, pp. 125, \$1.25.

The main part of this monograph consists of six chapters, as follows: I, Services rendered in the Baltimore market; II, Physical facilities; III and IV, The middlemen and their operation; V, Price-making; and VI, Conclusions.

In many respects this study is similar to studies made of a number of other wholesale markets. A distinction claimed by the author for his study is that whereas in other studies, "the discussion revolved about a list of functional types instead of existing groups of marketing agents," the primary purpose of this study—"is to analyze the organization and operations of the middlemen."

The first four chapters are given over to a detailed description and analysis of the functions and services performed, physical and other facilities for their performance, and a description of the kinds

and types of middlemen involved and their manner of functioning. Although many readers will no doubt find the detail too minute, it serves the useful purpose of making clear to one not familiar with the Baltimore market rather precisely what the situation is and brings out many historical and other reasons for its being so. The fact that the trading in fresh fruits and vegetables in Baltimore is decentralized at six points, each functioning in a different manner because of peculiar circumstances surrounding it, makes that market an interesting one to study.

Chief interest, however, centers in Chapter 5, Price-making, and Chapter 6, Conclusions, in which an appraisal is made of the physical facilities of the market, its organization, and the functioning of the middlemen. Although the approach to this study may be characterized as "institutional," the criteria on the basis of which the price-making process is appraised are those provided by the concept of the perfect market. The author, however, finds that, "While the wholesale fruit and vegetable market is usually considered a freely competitive one, there are several obstacles standing in the way of perfect competition," and speaks of "The partially monopolistic position held by certain dealers—"and of custom, brand and dealer preferences, and concludes that, "Despite the existence of obstacles to partial competition . . . , the Baltimore wholesale fruit and vegetable market is a *relatively* competitive one." Although the imperfections and obstacles enumerated consist for the most part of so-called "economics frictions," admissions of the existence of particular monopoly, of brand and dealer preferences, and obstacles to entrants into the trade, leads one to wonder whether or not an appraisal based on the criteria of Chamberlain and Robinson might not have led to different conclusions.

In view of the interest at present in costs and processes of market distribution, the suggestions for improving the Baltimore market made in the concluding chapter are timely and pertinent. The conclusions appear to be well supported by the information and analysis presented.

The hypercritical may wonder why differential services should not command differential prices (top of page 99), and to what extent costs of operation and other factors determine the scale of operations of the wholesale units (page 104). On the whole the study is a scholarly piece of work.

FRANK ROBOTKA

Iowa State College

Financing Government, Harold M. Groves. New York, Henry Holt and Company, 1939, 777 pp., \$3.75.

In this book, which was prepared for scholars, college students, and the lay public, and which covers principles, practices, and problems of public finance Professor Groves has necessarily covered a broad field. Although only limited parts relate to the public finance problems of agriculture as such, this phase of the subject is given as much emphasis as could be expected in a book of this type. The primary value of this book for those working in the field of agriculture, however, lies in the very comprehensive and understandable development of this whole subject which is receiving increased recognition in agricultural as well as in other fields.

The author devotes 410 pages to public revenues, 140 pages to public expenditures, and the remaining 190 pages of text to a brief introduction, and discussion of institutions, and problems of the revenue system as a whole, public borrowing, and problems of the fiscal system as a whole. The part relating to public revenues includes chapters on important taxes and groups of taxes such as the property tax, the income tax, death and gift taxes, motor vehicle taxes, social security taxes, taxes on business, and taxes on consumption. There are also chapters on the taxation of natural resources and on shifting and incidence. That part of the book devoted to public expenditures includes chapters on the general trend in expenditures, expenditures for protection, education, highways and other public works, public welfare and public health, state and federal aids, and opportunities for economy. Under institutions and problems of the revenue system as a whole the author discusses the power to tax, tax limits, tax exemptions and inter-governmental relations in taxation. Under problems of the fiscal system as a whole are included fiscal administration and fiscal policy as a factor in prosperity. A list of important selected readings is included at the end of each chapter.

Without overemphasis on court decisions and history, the author is able to add to the interest and to facilitate the discussion of current aspects of public finance by brief explanations of important court cases and of historical development. The emphasis on current problems and experiences in the field of public finance and the recognition of the close relationship with public administration makes the treatment of the subject a realistic one. The reviewer feels that the author has achieved a very nice balance between the

legalistic and the practical, the historical and the current, and the theoretical and the factual phases of the subject.

M. P. CATHERWOOD

Cornell University

International Directory of Agricultural Libraries, Rome, International Institute of Agriculture, 1939, pp. xxiv+311, 25 lire.

This handbook, printed in English and in French, contains information regarding some 1,200 agricultural libraries. It should be helpful to students of agriculture in locating published material in their respective fields, and should also facilitate inter-library relations.

The information is based chiefly on an inquiry carried out through the use of questionnaires and covers: (a) General agricultural libraries of over 2,000 volumes; (b) Agricultural libraries specialized in particular subjects, including small libraries; (c) Agricultural collections in general libraries; (d) Centers of agricultural documentation.

As far as possible, the Directory gives for each library the following information: (1) History of the library; (2) Collection; (subjects represented, size of the collection, special collections); (3) Library administration (cataloguing and classification systems; staff, etc.); (4) Conditions of use of the library (hours, external loans); (5) Relations with other libraries; (6) Bibliography of writings on the library; (7) Publications edited by the library.

NEWS ITEMS

Norris J. Anderson has accepted a position in the Agricultural Economics Department of the South Dakota State College and Agricultural Experiment Station. Professor Anderson formerly was connected with Colorado State College.

B. G. Andrews, of the Department of Agricultural Economics, N. C. State College, has been appointed field agent and will cooperate with the Agricultural Marketing Service, U.S.D.A.

G. H. Aull, head, department of agricultural economics and rural sociology, Clemson College, was consultant attached to the South Carolina state planning board during the summer.

The new Extension Economist at the University of Arizona is Howard R. Baker, who takes the place of Lloyd B. Shinn. Mr. Shinn has joined the staff of the California Cooperative Crop Reporting Service.

Paul M. Barrett, formerly Extension Soil Conservationist of Michigan State College, has accepted the position of Bureau of Agricultural Economics Representative in Michigan.

R. W. Bartlett, G. L. Jordan, and D. E. Lindstrom, formerly Assistant Professors in the Department of Agricultural Economics, University of Illinois, have been advanced to the rank of Associate Professor. Dr. Jordan was also Assistant to the Dean of the College of Agriculture, but will now devote all of his time to the Department of Agricultural Economics.

Murray R. Benedict, who has been on leave of absence during the major part of the past year, has returned to the Division of Agricultural Economics, University of California, Berkeley. Professor Benedict travelled extensively on the European continent and in England where he studied developments in the field of agricultural labor.

Clarence Boonstra, has been appointed to the staff of the Department of Agricultural Economics, Louisiana State University.

C. F. Bortfeld has been appointed Assistant Professor of Agricultural Economics at the North Dakota Agricultural College, Fargo, North Dakota.

On July 1, the name of the Connecticut State College was changed to the University of Connecticut, and the former Department of Economics at that institution was divided into two departments, one including Agricultural Economics and Farm Management and the other General and Business Economics. Donald O. Hammerberg is head of the former department, and Albert E. Waugh is in charge of the latter. Other members of the agricultural staff are Edmond A. Perregaux, George B. Clarke, and

Paul L. Putnam, and Messrs. L. Jay Atkinson and Bradford Crossmon.

Fred A. Clarenbach, has been assigned to Missouri by the Bureau of Agricultural Economics as Assistant Economist to participate in investigational work in the field of governmental readjustments in some counties in Missouri.

H. R. Cottam of the University of Wisconsin has been appointed research assistant in the Department of Rural Economics, Ohio Agricultural Experiment Station.

G. H. Craig, Assistant Agricultural Economist, Marketing Service, Department of Agriculture, Ottawa has resigned to accept a position as Assistant Economist at the Montana State College, Bozeman, Montana.

W. D. Curtis, has been appointed to the staff of Farm Management at State University of Louisiana.

C. B. Davidson has opened an office in Winnipeg where he specializes in economics and statistical service. He was recently made Secretary of a newly formed federation of farmers' associations in Manitoba.

John C. Doneth returned to Michigan State College July 1, as Extension Specialist in Farm Management, after spending the school year at Cornell University.

Louis S. Drake has resigned as acting Bureau of Agricultural Economics Representative in New York to accept the position of Assistant B.A.E. Representative in Michigan.

Herbert Erdmann, University of Wisconsin, is on temporary leave of absence and is working with the Dairy Section of the AAA.

Leo Fenske, formerly of the University of Minnesota, has become a member of the Department of Agricultural Economics, University of Idaho.

Frank M. Fitzgerald has resigned as assistant supervisor of rural research, University of Tennessee, in cooperation with Division of Research and Statistics, WPA.

J. W. Green, formerly Associate in the Department of Agricultural Economics, University of Illinois, has accepted a position at Illinois State Normal University.

R. E. L. Greene, Assistant Agricultural Economist, N. C. Agricultural College, has been granted a leave of absence for one year for advanced graduate study.

John R. Greenman, formerly with the General Crops Section, Agricultural Adjustment Administration, Washington, D. C., has been appointed Acting Associate Professor of Agricultural Economics, University of Florida, for the 1939-40 academic year.

T. W. Grindley has again been granted leave of absence from

his position as Chief of the Agricultural Branch, Dominion Bureau of Statistics, to continue as Secretary of the Canadian Wheat Board, Winnipeg.

John A. Guthrie and Wilfred Malenbaum have been appointed annual instructors on the faculty of Harvard University to assist in the instruction in the Economics Department and School of Public Administration in the handling of the work in agricultural economics and land utilization.

H. G. Halcrow has been appointed to the staff of Agricultural Economics at Montana State College for the year 1939-1940.

H. W. Hannah, formerly Associate in Farm Management in the Department of Agricultural Economics, University of Illinois, is now Assistant to the Dean of the College of Agriculture, and Associate in the Department of Agricultural Economics.

W. A. Hilgeson is in charge of an office opened by the Agricultural Marketing Service, September 15, for investigations under the provisions of the Perishable Agricultural Commodities, the Produce Agency, and the Standard Container Acts in the States of Washington, Oregon, Idaho, Utah, Nevada, and northern California.

Karl Hobson, who has acted as Assistant Farm Economist in the Extension Division for the University of Idaho, has obtained a leave of absence for two years to act as Project Leader for Idaho under the Land Use Planning Program. B.A.E. and Idaho Agric. Ex. Stations Cooperating.

Harold F. Hollands of the State College of Washington was promoted to Associate Agricultural Economist, effective October 1, 1939.

Paul G. Homeyer, has been appointed to the staff of the Department of Agricultural Economics, Louisiana State University.

E. C. Hope, head of the Department of Farm Management, University of Saskatchewan, completed his work for the doctor's degree at Cornell University in September. Professor Hope has returned to resume his duties in Saskatchewan.

E. M. Hughes, who has been an Associate in Agricultural Economics Extension in the Department of Agricultural Economics, University of Illinois, now has the rank of Assistant Professor.

D. B. Ibach, who for a number of years has been Extension Specialist in Farm Management at the Missouri College of Agriculture, has resigned this position and accepted an appointment with the Rural Electrification Administration in Washington.

J. W. Johansen, Extension Marketing Economist, N. C. State College of Agriculture has just returned from a year's leave of absence studying markets and cooperative associations.

Phillip E. Jones, State University of Louisiana, has been ap-

pointed to work on a cooperative project on land utilization with the Bureau of Agricultural Economics, United States Department of Agriculture.

Don R. Keene has resigned as Assistant Professor of Agricultural Economics at the North Dakota Agricultural College to accept a position making flood control surveys with the Bureau of Agricultural Economics at Berkeley, California.

Roy I. Kimmel and Raymond C. Smith have been appointed as chief program analysts of the Bureau of Agricultural Economics. Mr. Kimmel has been serving as coordinator of Department programs in the southern Great Plains, with offices at Amarillo, Tex. Mr. Smith has been regional director of the Farm Security Administration's Third Region, with regional headquarters at Indianapolis, Ind.

B. T. Lanham, Jr., accepted a position as Assistant Agricultural Economist with the Alabama Polytechnic Institute as of August 1.

Herschel W. Little, State University of Louisiana, has been appointed to work on a cooperative arrangement between the Department and the Division of Cotton Marketing of the Agricultural Marketing Service, United States Department of Agriculture.

H. H. Lord, former Assistant State Supervisor of Rural Research in Montana has been appointed to the staff in Agricultural Economics at Montana State College as Assistant Professor.

I. S. McArthur, Assistant Economist, and G. C. Elliott, Agricultural Assistant, returned to their positions with the Economics Division at Ottawa upon completion of the spring terms at Illinois and Cornell respectively.

Wallace McMartin was appointed Instructor in Farm Management and Agricultural Economics, State College of Washington, effective September 1, 1939. He is taking the place of Alden E. Orr, who is on leave.

W. R. Meadows, formerly in charge of the Division of Cotton Marketing is again associated with the Department of Agriculture.

Richard G. Milk, of Cornell, has been appointed assistant in land use planning, University of Tennessee, in cooperation with the Bureau of Agricultural Economics.

Troy Mullins, State University of Louisiana, has been appointed to work on a cooperative arrangement with the Bureau of Agricultural Economics, Division of State and Local Planning.

Edward J. Murphy has been appointed as head of the Grain Division of the Agricultural Marketing Service. Mr. Murphy had been acting in charge of the division since the death of E. C. Parker on July 21 of this year.

E. G. Nourse of the Brookings Institution at the meeting of the Social Science Research Council in September resigned as chair-

man of the Council's Problems and Policy Committee, which post he has occupied for some five years. Dr. Nourse will, however, continue as a member of that committee and of the Advisory Committee on Social and Economic Research in Agriculture. At the same meeting, he was elected vice chairman of the Council.

Norman Nybrotten, from the Property Division of the Wisconsin Tax Commission has accepted a position in the Department of Agricultural Economics, University of Idaho.

Kenneth Parsons, on leave from the University of Wisconsin, is attending the University of Chicago under a fellowship granted by the Farm Foundation.

Milo J. Peterson, a graduate of the University of Minnesota and Cornell University, has been appointed assistant agricultural economist in the Department of Agricultural Economics and Rural Sociology in the South Carolina experiment station, Clemson, South Carolina.

Ben H. Pubols, Head of the Department of Farm Management and Agricultural Economics of the State College of Washington, returned to his office July 1, 1939, after a year's leave.

W. P. Ranney, formerly of University of Minnesota, has been appointed associate professor of Agricultural Economics and Rural Sociology, University of Tennessee.

C. G. Randell of the Livestock and Wool Section of the Cooperative Research and Service Division, Farm Credit Administration, returned to his work after a leave of absence on account of illness.

R. H. Raper, formerly Field Agent in the N. C. Department of Agricultural Economics and Rural Sociology has been appointed Extension Cotton Economist.

E. H. Regnier, formerly Assistant in Rural Organization, is now Associate in Rural Sociology Extension, Department of Agricultural Economics, University of Illinois.

James W. Reid, formerly Assistant Professor of Rural Economics and Sociology, University of Arkansas College of Agriculture, has accepted a position as Associate Professor of Geography at Stephen F. Austin State Teachers College, Nacogdoches, Texas.

John B. Roberts of the University of Kentucky and W. E. Morgan, State Representative of the Bureau of Agricultural Economics at Texas A and M, are studying at Harvard University under fellowships awarded by the General Education Board. Charles Matlock, Assistant Economist of the Bureau of Agricultural Economics, Hyde Buller, Technical Specialist in the Soil Conservation Service, Dale Clark, Associate Agricultural Economist of the AAA, and William C. Welden, of the Farm Credit Administration, have received Littauer Fellowships in the Harvard Graduate School of Public Administration.

A. E. Richards and S. C. Hudson, Economist and Assistant Economist respectively, of the Economics Division, Marketing Service, Department of Agriculture, Ottawa, obtained doctor's degrees in Agricultural Economics at Cornell University in June and returned to Ottawa to resume their work with the Economics Division.

John D. Rush of Clemson, has been appointed assistant in land use planning, University of Tennessee, in cooperation with Bureau of Agricultural Economics.

Charles F. Sayre, Delbert Myrick and Albert Thornbrough have left Harvard University to accept positions as Associate Economists in the Bureau of Agricultural Economics.

Rainer Schickele of Iowa State College, who holds a Social Science Research Council fellowship this year, is devoting it to study at Harvard University.

E. G. Schiffman resigned his position as Assistant Agricultural Economist with Alabama Polytechnic Institute to continue graduate work at Harvard.

L. H. Simerl's title has been changed from Extension Specialist to Associate in Agricultural Marketing, Department of Agricultural Economics, University of Illinois.

Glenn R. Smith has been promoted from Assistant Agricultural Economist to Associate Agricultural Economist at N. C. State College of Agriculture.

E. A. Stokdyk who has held the position of Deputy Governor of the Farm Credit Administration during the past year, returned to his former position as President of the Berkeley Bank for Cooperatives in August.

W. Preston Thomas, Head of Department of Agricultural Economics, Utah State Agricultural College, has resumed his duties, after having spent a year on sabbatical leave studying at Cornell University and other institutions.

N. O. Thompson, formerly Assistant in the Department of Agricultural Economics, University of Illinois, has accepted a position as Assistant Agricultural Economist, Arizona State Experiment Station.

Gerhard Tintner has been promoted from Assistant Professor to Associate Professor of Economics and Mathematics at Iowa State College.

Harry C. Trelogan transferred from the Cooperative Research and Service Division to the Economic and Credit Research Division of the Farm Credit Administration.

M. L. Upchurch, has accepted a position as assistant economist with the Division of Agricultural Economics, B.A.E. and is located in Oregon.

Sylvan T. Warrington, formerly extension economist at the University of Minnesota, is now with the Cooperative Division, Farm Credit Administration, Washington, D. C.

Geo. S. Wehrwein, University of Wisconsin, will be on leave during the second semester at which time he will instruct in land economics at Cornell University. L. C. Gray, Land Economist of the U.S.D.A., will teach several courses at Wisconsin during Dr. Wehrwein's absence during the second semester.

The Office of Foreign Agricultural Relations as a part of the Office of the Secretary of Agriculture was established as of July 1. The Office of Foreign Agricultural Relations has taken over the functions and personnel of the Foreign Agricultural Service not transferred to the Department of State under the terms of the President's Reorganization Plan No. II. L. A. Wheeler, chief of the Foreign Agricultural Service, has been designated director of the Office of Foreign Agricultural Relations. The personnel of the Office of Foreign Agricultural Relations will consist of the Washington staff of the Foreign Agricultural Service and certain commodity specialists who will be assigned alternatively in Washington and on special commodity investigations abroad.

O. H. White has been appointed to the staff of the Economic and Credit Research Division, Farm Credit Administration, to succeed M. S. Parsons who resigned to accept a position with the Division of Farm Management and Costs, Bureau of Agricultural Economics, United States Department of Agriculture.

B. O. Williams, rural sociologist for the South Carolina experiment station, was visiting professor at Louisiana State University during the summer 1939.

Robin Williams, formerly of the staff of the North Carolina State College of Agriculture, recently joined the teaching and research staff of the College of Agriculture and Experiment Station of the University of Kentucky.

Beginning with the fall semester of 1939-40, the Division of Agricultural Economics of the University of California will offer courses in agricultural economics and farm management at the University of California at Los Angeles. The work at Los Angeles will be initiated by Roy Smith who was formerly Instructor in Agricultural Economics in the College of Agriculture branch at Davis. The work in agricultural economics given on the three campuses at Berkeley, Davis, and Los Angeles is coordinated under the supervision of Carl L. Alsberg, Director of the Giannini Foundation of Agricultural Economics, University of California, Berkeley.

Arthur E. Anderson, Vice President and Secretary of the Berkeley Bank for Cooperatives, died August 6, 1939.

Mr. Anderson received his academic training in agricultural economics at the University of Nebraska (B.A. 1912), Cornell University (M.S. 1925), and University of California (1931-1933). From 1912 to 1931, he was active in agricultural extension work in various capacities in Nebraska, Ohio, and South Dakota, serving as Director of Extension at South Dakota State College from 1925 to 1933. Since 1933, he had been with the Berkeley Bank for Cooperatives of the Farm Credit Administration.

Edward C. Parker died July 21, 1939. Mr. Parker had been in charge of the Grain Division of the Bureau of Agricultural Economics, for 6 years. Before entering the Government service, he had been agricultural adviser to the Government of Manchuria, 1908 to 1912.

Wells Alvord Sherman, pioneer in the fruit and vegetable marketing work of the U. S. Department of Agriculture, died on August 2, 1939. Mr. Sherman had retired at the age of 70, a year before his death. Mr. Sherman was placed in charge of experimental work that led to the establishment in 1915 of the market news service on farm products. In 1920 he was made head of the Fruit and Vegetable Division of the Bureau of Markets.

**PROGRAM FOR THE THIRTIETH ANNUAL
MEETING OF THE AMERICAN FARM
ECONOMIC ASSOCIATION**

ADELPHIA HOTEL, PHILADELPHIA

DECEMBER 27-29, 1939

Wednesday, December 27

Wednesday Forenoon

10:00 A.M.—PERSONNEL TRAINING AND RECRUITMENT

Chairman: E.G. Nourse, The Brookings Institution

- (1) "The Nature and Scope of Training for Men Contemplating Work in the Field of Agricultural Economics"

C. L. Alsberg, University of California

- (2) "Needed Additions to the Theoretical Equipment of an Agricultural Economist"

T. W. Schultz, Iowa State College

- (3) "New Developments in Personnel Selection, Training, and Advancement in the Federal Service"

Roy F. Hendrickson, U. S. Department of Agriculture

Discussion: O. B. Jesness, University of Minnesota

W. E. Grimes, Kansas State College

Wednesday Afternoon

**2:30 P.M. (I)—CRITICAL APPRAISAL OF THE WORK NOW BEING DONE IN
THE FIELD OF FARM MANAGEMENT**

Chairman: Sherman E. Johnson, Bureau of Agricultural Economics

- (1) (T. W. Schultz's paper, "Theory of the Firm and Farm Management Research," August issue of *THE JOURNAL* to be basis for discussion.)

Discussion: Stanley Warren, Cornell University

H. C. M. Case, University of Illinois

G. W. Forster, University of North Carolina, State College

D. C. Mumford, Oregon State College

Russell Kifer, Bureau of Agricultural Economics

**2:30 P.M. (II)—THE ROLE OF CREDIT IN THE ECONOMIC ORGANIZATION
OF OUR NATIONAL AGRICULTURE**

Chairman: W. I. Myers, Cornell University

- (1) "How Should the Industry of Agriculture be Financed?"

W. G. Murray, Iowa State College

- (2) "The Use of the Normal Value Concept as a Stabilizing Influence in Agriculture"

E. C. Young, Purdue University

Discussion: F. F. Hill, Governor, Farm Credit Administration
 E. G. Nourse, The Brookings Institution
 Claude L. Benner, Continental American Life Ins. Co.

2:30 P.M. (III)—NATURE OF COMPETITION IN THE AGRICULTURAL MARKET

Chairman: H. B. Price, University of Kentucky

- (1) "The Changing Organization of Agricultural Markets"
 A. C. Hoffman, Bureau of Agricultural Economics
- (2) "Analyzing the Economic Significance of Changes in Market Organization"

H. B. Rowe, The Brookings Institution

Discussion: R. K. Froker, University of Wisconsin
 T. G. Stitts, Farm Credit Administration

5:30 P.M.—MEETING OF THE EXECUTIVE COMMITTEE

Wednesday Evening

8:00 P.M.—WHAT IS THE WAY OUT ON THE FARM PROBLEM?

(Panel Discussion: Papers to be prepared and circulated in advance to members of the Association, but not to be read at the meeting. Each speaker will be given five minutes to summarize the main points of his paper and then submit to questioning by members of the panel and from the floor.)

Chairman: H. R. Tolley, Bureau of Agricultural Economics

- (1) "Measures Needed to Achieve Conservation and Efficient Production"

W. W. Wilcox, Iowa State College

- (2) "Suggestions for a National Program of Rural Rehabilitation and Relief"

James Maddox, Farm Security Administration

- (3) "What Lines of Action Should Agriculture Adopt to Meet the Problem of Supply and Price?"

J. K. Galbraith, Princeton University

- (4) "Changes in the General Economy Needed in the Interest of Agriculture"

Alvin Hansen, Harvard University

Panel: J. B. Hutson, Agricultural Adjustment Administration

Dillon Myer, Soil Conservation Service

Ray Smith, Bureau of Agricultural Economics

M. K. Bennett, Leland Stanford University

Thursday, December 28

7:30 A.M.—GROUP BREAKFASTS

Cornell Breakfast—F. F. Lininger in charge

Illinois Breakfast—H. C. M. Case in charge

Minnesota-Harvard Breakfast—Sherman E. Johnson in charge

Wisconsin Breakfast—Henry Keller, Jr. in charge

Thursday Forenoon

10:00 A.M. (I)—PRESERVING COMPETITION VERSUS REGULATING MONOPOLY

(Joint session with the American Economic and the American Statistical Associations.)

Chairman: Edward S. Mason, Harvard University

- (1) "What A Revitalized Anti-Trust Policy Can Do To Preserve Competition"

Corwin Edwards, Department of Justice

- (2) "Market Positions and Business Policies Resistant to Effective Anti-Trust Enforcement"

Paul Homan, Cornell University

- (3) "Standards of Public Control of Market Positions and Business Policies"

Donald Wallace, Williams College

10:00 A.M. (II)—THEORETICAL ASPECTS OF LAND ECONOMICS

Chairman: George S. Wehrwein, University of Wisconsin

- (1) "Needed Points of Development and Reorientation in Land Economic Theory"

Joint Paper by L. C. Gray and Mark Regan, Bureau of Agricultural Economics

Discussion: Conrad Hammar, University of Missouri

R. H. Allen, University of Kentucky

Leonard A. Salter, Jr., Bureau of Agri. Economics

R. R. Renne, Montana State College

10:00 A.M. (III)—SOUTHERN AGRICULTURAL PROBLEMS

Chairman: W. W. Alexander, Farm Security Administration

- (1) "Cotton, Land, and People: A Statement of the Problem"

I. W. Duggan, Agricultural Adjustment Administration

- (2) "How Can the Southern Population Find Gainful Employment?"

Rupert B. Vance, University of North Carolina

- (3) "What Changes in National Policy Does the South Need?"

Calvin Hoover, Duke University

Discussion: R. W. Hudgens, Farm Security Administration

E. S. Draper, Tennessee Valley Authority

Francis P. Miller, The Council on Foreign Relations

Thursday Noon

12:00 M.—JOINT LUNCHEON WITH RURAL SOCIOLOGICAL SOCIETY

Chairman: Henry C. Taylor, The Farm Foundation

- (1) "The Problem of Poverty in Agriculture"

M. L. Wilson, U. S. Department of Agriculture

Discussion: J. I. Falconer, Ohio State University

Dwight Sanderson, Cornell University

Thursday Afternoon

2:30 P.M.—ROUND TABLES

I.—Some Problems in Imperfect Competition in Agricultural Markets

Chairman: Leland Spencer, Cornell University

- (1) "Milk: (Transportation, Country Assembly and Allocation of Supplies in Contiguous Fluid Milk Markets)"

Joint paper by D. O. Hammerberg, Connecticut State College and Raymond G. Bressler, Jr., New England Research Council

- (2) "Livestock: Market-Sharing in the Packing Industry"
William H. Nicholls, Iowa State College
- (3) "State Laws Which Limit Competition in Agricultural Products"
George R. Taylor, Amherst College

II.—Current Developments in Farm Management

Chairman: H. C. M. Case, University of Illinois

- (1) "Determining Input-Output Relationships in Milk Production"
Einar Jensen, Bureau of Agricultural Economics
- (2) "Supervised Farming"
Elmer Starch, U. S. Department of Agriculture
- (3) "The Unit Reorganization Program for the Southern Great Plains"
Roy I. Kimmel, Bureau of Agricultural Economics

III.—Sales and Service Policies of Credit Agencies

Chairman: Paul Bestor, Prudential Life Insurance Company

- (1) "When and Under What Conditions Should a Farm Be Foreclosed?"
L. J. Norton, University of Illinois
- (2) "How Can Delinquent and Foreclosed Properties Best Be Served and Handled?"
J. M. Huston, Federal Land Bank of St. Louis
- (3) "What Elements Enter into a Desirable Resale Policy?"
E. C. Johnson, Farm Credit Administration

IV.—Preserving Competition versus Regulating Monopoly

(Joint session with The American Statistical and The American Economic Associations.)

Chairman: Edward S. Mason, Harvard University

Discussion of papers of morning session.

Jerome Frank, Securities and Exchange Commission
Leon Henderson, Securities and Exchange Commission
Melvin de Chazeau, University of Virginia
Milton Katz, Harvard University

Thursday Evening

7:00 P.M. (I)—AGRICULTURAL HISTORY

(Joint with The Agricultural History Society)

Chairman: B. H. Hibbard, University of Wisconsin

- (1) "Early Beginnings of Agricultural Economics"
Henry C. Taylor, The Farm Foundation
- (2) "American Agriculture 1839 and 1939"
Arthur Peterson, Bureau of Agricultural Economics

8:00 P.M. (II)—COUNTY PLANNING

Chairman: J. E. Carrigan, University of Vermont

- (1) "The County Planning Project—A Cooperative Approach to Agricultural Planning"

Bushrod Allin, Bureau of Agricultural Economics

Discussion: J. D. Black, Harvard University

D. W. Watkins, South Carolina State Extension Service

P. V. Kepner, Extension Service

H. C. Ramsower, Ohio State University

8:00 P.M. (III)—THE USE OF AGRICULTURAL SURPLUSES TO OVERCOME NUTRITIONAL DEFICITS.

Chairman: Warren Waite, University of Minnesota

- (1) "Agricultural Surpluses and Nutritional Deficits: A Statement of the Problem and Some Factors Affecting its Solution"

O. V. Wells, Bureau of Agricultural Economics

- (2) "Programs for Using Agricultural Surpluses to Reduce Malnutrition and to Benefit Farmers"

F. V. Waugh, Bureau of Agricultural Economics

Discussion: Hazel K. Stiebeling, Bureau of Home Economics

George J. Stigler, University of Minnesota

Milo Perkins, Federal Surplus Commodities Corp.

8:00 P.M. (IV)—AGRICULTURAL STATISTICS

Chairman: F. A. Pearson, Cornell University

- (1) "New Developments in Agricultural Sampling Techniques"

Joint Paper by Arnold J. King and Glenn Simpson

Agricultural Marketing Service, Ames, Iowa

- (2) "The Agricultural Census of 1940"

W. B. Jenkins, U. S. Census Bureau

- (3) "Characteristics of U. S. Poultry Statistics"

E. S. Kimball, Agricultural Marketing Service

Discussion: E. A. Perregaux, Connecticut State College

Joseph A. Becker, Agricultural Marketing Service

G. W. Snedecor, Iowa State College

Friday, December 29

7:30 A.M.—CALIFORNIA BREAKFAST—James Marshall in Charge

9:00 A.M.—BUSINESS MEETING

Friday Forenoon

10:30 A.M. (I)—EFFECT OF THE WAR UPON AMERICAN AGRICULTURE

Chairman: Leslie Wheeler, U. S. Department of Agriculture

(1) "War Adjustments for American Agriculture"

Asher Hobson, University of Wisconsin

(2) "Financial and Monetary Problems of the War in Relation to Our Agricultural Exports"

Leo Pasvolsky, The Brookings Institution

Discussion: A. G. Black, Office of Marketing and Regulatory Work
Walter Gardner, Federal Reserve Board

10:30 A.M. (II)—STATISTICAL TECHNIQUES AND ECONOMIC THEORY

(Joint with The American Statistical Association)

Chairman: Mordecai Ezekiel, U. S. Department of Agriculture

(1) "The Statistical Analysis of Economic Time Series"

Gerhard Tintner, Iowa State College

(2) "Re-examination of the Derivation of Supply and Demand Functions in View of Recent Theoretical Developments"

Elmer Working, University of Illinois

Friday Noon

12:30 P.M.—ANNUAL LUNCHEON

(1) "The Place of Farmers, Economists, and Administrators in Developing Agricultural Policy"

Honorable Chester C. Davis, Federal Reserve Board

Friday Afternoon

2:30 P.M.—FARM LABOR IN A CONTROL-CONSCIOUS WORLD

(Joint session with Rural Sociological Society)

Chairman: J. D. Black, Harvard University

(1) "The Impact of Agricultural, Industrial, and Labor Control Policies Upon Farm Labor: A Statement of the Problem"

W. T. Ham, Bureau of Agricultural Economics

(2) "An Appraisal of Possible Remedial Measures"

(a) Lowry Nelson, University of Minnesota

(b) Murray Benedict, University of California

4:30 P.M.—MEETING OF THE EXECUTIVE COMMITTEE.

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CONSTITUTION OF THE AMERICAN FARM ECONOMIC ASSOCIATION

ARTICLE I

Name.—The name of the Association shall be The American Farm Economic Association.

ARTICLE II

Object.—The objects of this Association shall be to promote effective investigation and free discussion of topics and issues in agricultural economics, and higher standards of accomplishment in research, teaching, and extension in this field, by fostering study, writing, and contacts which contribute to these ends.

ARTICLE III

Membership.—The membership shall consist of persons interested in Farm Management and Farm Economics.

Associations of ten or more members in a state or region may be recognized by the Executive Committee as local chapters of the American Farm Economic Association. Such locals may admit as members only persons who are members of the American Farm Economic Association but they may admit associate members on such conditions as they desire.

ARTICLE IV

Organization.—The officers shall be a President, two Vice-Presidents, and a Secretary-Treasurer, who shall be elected for one year, and who shall serve until their successors shall qualify. In case of incapacity of the President to act, the Vice-President receiving the highest number of votes shall act as President.

The Executive Committee shall consist of the active officers, and the latest three past Presidents. It shall appoint annually the Editor of the JOURNAL OF FARM ECONOMICS. It may adopt rules and regulations for the conduct of its business not inconsistent with the constitution of the Association, or with rules adopted at the annual meeting. It shall act as a committee on time and place of meetings, and perform such other duties as the Association shall delegate to it.

There shall be a standing committee on investment policy with respect to Association funds. The Secretary-Treasurer shall be a member of this committee. The actions of this committee shall be subject at all times to review by the Executive Committee.

The President, Vice-Presidents, and such other members as the President may appoint shall constitute a committee on the preparation of a program for the annual meeting. The President shall act as chairman of this committee.

Special committees may be appointed in accordance with the needs of the Association. Special committees and the investment committee shall be appointed by the President with the approval of the Executive Committee.

ARTICLE V

Election of Officers.—The President and the two preceding past Presidents shall constitute a nominating committee. The President shall act as chairman of the committee.

Two nominations shall be made for each office except for Secretary-Treasurer, for which one nomination shall be presented. No person who has served a term as President shall be nominated for that office or eligible for election to it.

Not later than December 1 of each year, the Secretary-Treasurer shall mail a ballot to each member of the Association who has paid dues for the current year, not including corporations, libraries, or other institutions. Said ballot shall provide for a vote for each elective officer. For each office the ballot shall contain one blank line. A brief biographical sketch of each nominee shall be included.

The ballot shall be enclosed in an envelope which shall be marked on the outside as follows: "Ballot for Officers of the American Farm Economic Association. This ballot shall reach the Secretary-Treasurer not later than the first day of the annual meeting."

"Name _____". Your name is required for checking with the list of members. Ballots will be opened by the tellers in such a manner as to preserve the secrecy of the ballot."

The sealed ballots shall be opened by tellers at the annual meeting, and they shall report at the annual business meeting. The persons receiving a majority of votes for the offices of President and Secretary-Treasurer shall be declared elected. The two candidates receiving the highest number of votes for the offices of Vice-President shall be declared elected.

If no one has received a majority of the votes cast for the offices of President and Secretary-Treasurer, the position shall be filled by ballot at the annual business meeting from the two receiving the largest number of votes for the office. A similar procedure shall be followed in case of tie for the office of Vice-President.

ARTICLE VI

Dues.—The rate for members of the Association shall be five dollars per year, payable in advance.

Life membership in the Association may be secured by the payment of one hundred dollars (\$100). Funds thus obtained shall be invested and only the income spent.

ARTICLE VII

Meeting.—There shall be held an annual meeting of the Association, and such other meetings as the Executive Committee may determine. Notice of meetings shall be mailed to each member at least four weeks in advance.

ARTICLE VIII

Amendments.—This constitution may be amended by a two-thirds vote of the members present at any meeting of the Association.

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